

THE BIOLOGIST

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BIOLOGY IN ANCIENT EGYPT

By LESTER P. COONEN

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History has unwittingly set up the Nile River to compete with the Tigris-and-Euphrates system for honors of precedence in the support of civilized man. Whether Egyptians preceded Mesopotamians, by a few centuries, in their emergence from Neolithic times is not a matter for resolution here and now. It does seem significant, however, that the two civilizations experienced more-or-less parallel development during most of their early history. And, no doubt, at times there were chiasmic connections between them. They could not have remained completely independent during all of their many centuries of existence. One bit of evidence that Mesopotamian influence was felt in Egypt: The Ebers Papyrus contains an Assyrian chant to the Gods of healing (1).

Egypt, as well as Mesopotamia, left noteworthy and interesting references to biological data. We think that we can see many of the stages of transition from the late Stone Age to a clear-cut level of civilization. But, because some Neolithic practices persist even in modern society, it is not always easy or justifiable to force archaic but recorded practices and events into a nice pattern of step-by-step progression. For instance, certain recent writers describe 19th and 20th century medical practices which logically could be relegated to domestic patterns of 1000, 5000, or 15,000 years ago. Some

of our very contemporaries swear by stump water to remove freckles; and horse chestnuts to cure rheumatism (2). In Norfolk, England, a spider in a cloth bag, hung over the mantle was even recently believed to be an effective cure for whooping cough. A bottled beetle was fancied to work similar wonders in Donegal; but in Suffolk a child's head was dipped into a meadow hole; and in Yorkshire an owl broth was believed to do the trick; finally, in Lincolnshire only a meal of fried mice supposedly would drive away the whoop (3).

Rats, mice, squirrels and beavers were elsewhere identified with human health and development. Frazer (4) reports that deciduous teeth of certain South Sea Island children were thrown to rats and mice to insure a new crop of strong permanent ones. He further states that in Swabia the Mouse's head was bitten off and tied around the child's neck, while in Bohemia three mouse heads bound together and suspended from the child's neck by a loop of red thread were employed for sound tooth development.

Now, when we learn that the whole skin of the mouse was sometimes fed to the indisposed Egyptian child (5) we are not distressed by the illogic of it. And we are induced to exercise kindly restraint when learning from the land of the Nile that certain child-mummies contain whole-mouse re-

mains (5). So, let us not bisect the old Egyptian culture, damning one side as the mouse-in-medicine era, and blessing the other as scientific and progressive; the mouse seems to have been in and out of pediatrics in other climes and times and may not necessarily be identified with the naivete of ancient Egypt.

Botany

From time to time all nature seems to have been woven into a pantheistic design, in which biology necessarily figured. Frazer (6) tells the long story of tree worship among the Celts, Swedes, Esthonians, Lithuanians, Italians and, up to 1650, among the Finns. These and several other ancient, pagan cultures had sacred groves wherein worshippers met for religious exercises. Or a certain single tree, such as an oak, which had grown to gigantic proportions and had withstood the attacks of storm and lightning, had been deified. The immortal name Linne or Linnaeus is said (7) to have been taken from a giant Linden tree on the property of the Swedish biologist's ancestors. The tree was carefully watched and protected, for legend whispered that when the tree died the clan too would die. But all trees seem to have been regarded with a degree of theistic awe in certain cultural sectors, perhaps underwritten by vestiges of a forest economy. Unreasonable penalties were exacted in ancient Germany from the culprit who dared peel bark from a living tree: His navel was circumcised, nailed to a tree "and he was driven around and around 'till all his guts were wound about the trunk" (6). Whether the stern motivation and violent censure were religious, biological or economic is moot. Frazer implies that there was a religious or mystical motive. Nevertheless, the tree, a biological unit, demanded frightful reparations for its damaged cambium.

Thus, the special Egyptian reverence for the Sycamore (6) perhaps shows no more than the identification of mystical power with life, the source of food, shelter, and fuel. This practical-deity concept is probably further strengthened by the account of their harvest song dedicated to the death of

the corn-spirit, rendered by the corn (wheat) reapers. Such planting and harvesting festivities, according to Frazer, were common in Russia, Rome and Europe.

Herodotus, the first roving reporter, sometimes looked at Egypt through the eyes of an economist; at other times as a historian and an esthete. Occasionally the biologist and the naturalist show through his diaphanous phrases. He described Egypt's lotus and water lily. He records the economic virtues of the castor plant, particularly its oil as an unction and as a malodorous lamp fuel. He points to her papyrus plant as the source of material for writing and for forming ship sails; and to its lower stem for food. He notes the use of three-foot planks of acacia piled like bricks, and fastened together, to form the bulkheads of ships (8). But this Greek writer was a comparatively recent observer (ca. 450 B. C.) and collector of historical items. Older data comes from old papyral records discovered in modern times.

Egypt's dry climate has been kind to the preservation of some of her botanical specimens. Plant fragments have been salvaged from bricks, wherein they were preserved together with wheat and barley straw—normal ingredients of the Egyptian brick—to give us some direct evidence of her floral interests. Better still, 4000-year-old funeral wreaths have been soaked in water to soften them for examination and successful identification (9). Of course, there is no question of Egypt's practical and esthetic interest in the world of botany. Her maintenance of botanic gardens (2) vouches for that.

Medicine

It has been said that the first man was a physician. No aspect of biology is so personal as that which attempts to establish rules and synthesize prescriptions to preserve life and health in the human body. Egypt did well in that sphere; essentially all of her important contributions to biology were anthropocentric, and of three categories: medical and surgical practice; embalming; and personal hygiene.

Her tracts on medicine, recently dis-

covered and translated, have been voraciously studied and carefully annotated.

Im-hotep, the first physician honored by history, is either a great figure in the history of medicine, or the historian's mental child and a bothersome puppet. He is often deified in Egyptian writings. A temple had been built to his honor on the Isle of Philae (10); another near Memphis (11). Whether he was a myth or a medico has been seriously questioned (15). However, Osler, the respected medical historian, speaks admiringly of Im-hotep as the blood-and-flesh designer of the 190-foot stepped Pyramid of Zoser, the philosopher, the royal advisor and confidant, besides being the famous physician. Whether he had real meat on real bones or whether he was a woolly bit of imaginative ectoplasm, he is now an historical character to be reckoned with in the biography of Biology.

Another real-or-fancied figure in the haze on the horizon of Egyptian history is Thoth who, with his inspired celestial chisel, "wrote" his books on stone columns. Whether he was a real or a mythical "columnist," the fact still stands that extensive writings in astrology, magic and alchemy survive under his name or his synonym, Hermes Trismegistus (Thrice Great), and are known as the Hermetic books. They survive, not in their entirety but rather as fragments, allusions, and quotations. This work was supposedly a 42-book "shelf" of required reading for the ancient priests and priest-physicians. The first 36 volumes were mastered by the former; the last six by the medical practitioners (3). Those six books contained anatomy, surgery, pharmacology, gynecology, pathology and ophthalmology. For the most part, the context was primitive medical lore, although cupping, circumcision, venesection and removal of bladder stones were done from recorded instructions in these early medical books (3).

Five or six well known treatises, executed on papyrus, are extant and have been translated. In general, the oldest is the most scientific; the more recent ones reflect magic and mysticism, often containing only the germ of scientific approach to a particular

problem, with a heavy shroud of impenetrable verbiage, especially incantations, to obscure the biological meaning.

The Ebers Papyrus, the oldest and most important biological document of ancient Egypt, was written in hieroglyphics on a strip of papyrus about a foot wide and 65 feet long. An Arab, said to have found it in a tomb near Thebes, in the Nile Valley, mysteriously appeared with it in 1873. Georg Ebers, a roving German Egyptologist acting as an agent for his government, procured it for \$8000. It now rests in the Leipsig Library. Ebers himself translated most of the document, but not until 1937, when more of the symbols were known, did Ebbells of Denmark complete the translation as it stands today (12).

This prime document was probably written about 1550 B.C. (13), or earlier (14), and is probably a copy of an original done 1000 years earlier (15).

Another, the Edwin Smith Papyrus (16), is noted for its treatises on surgery. Forty-eight cases are enumerated in more or less detail, sometimes with a workable check list of questions to lead the practitioner to a diagnostic conclusion: e.g., can he lift his arm? Does he shiver? Does he bleed from the nose? Can he open his mouth? and even, How strong is the pulse?

Injuries to specific parts of the body were treated separately: eyebrow, nose, cheek, ear, jaw, temple and forehead were included under the general consideration of head and skull. Directions for bandaging wounds, restoring fractures and burning out tumors were carefully given.

Although the later writings, such as the Berlin and the Southern California Papyri, have prostituted their biological importance to magic and superstition, altogether considered, these several Egyptian writings constitute a bloc of applied human biology, considerable in scope and in depth. They are as intriguing and as monumental to the biologist as the silent, megalithic pyramids are to the modern architect.

As is to be expected, not all is high class medicine. Some seems outright ridiculous in its claims. One recipe to

stop falling hair called for rare and exotic ingredients. The guaranteed effectiveness was absolute if one could procure the fat of a lion, hippopotamus, crocodile, goose, snake, and Nubian ibex (15) and could mix them in correct proportions. But perhaps the mixture did or would work the wonders claimed for it!

Knowledge of hair nurture had a negative application: a specific concoction purportedly brought about the loss of hair (17). It had a particularly sinister purpose: it made the flowing tresses of a harem rival instantly and completely deciduous. Another detailed recipe purported to change doddering old swains to young, sharp blades by an applied salve, and "had been found effective many times," according to the statement laboriously worked on the criss-crossed papyrus piths.

Let us mitigate our condemnation of the Pharoh's medicine men by noting that England's peerless physician and clinician of the 17th century, Thomas Sydenham, made a similar claim. Without tongue-in-check, he said that the spark of youth truly could be transferred during sleep from a young healthy man to an ailing and aged bedfellow; therefore he prescribed it when needed.

The papyri mention 875 recipes (2) and seven hundred remedies. They called for some ingredients which are still important and necessary in the treatment of diseases. Squill, opium, castor oil, coriander, saffron, gentian, pomegranate, olive oil, acacia and several metallic salts, were among the pharmaceutical supplies.

Vanity, a human attribute as old as man, prompted the use of biologicals in the treatment of wrinkles, freckles, sunburn and dandruff. No doubt, psychology was a most powerful supra-pharmaceutical component of these and other prescriptions. Nevertheless, drugs were plentiful and used widely. Homer paid his homage to this abundance when he acknowledged that Egypt was "teeming with drugs."

The medical papyri give rather extensive discourses on, descriptive minutiae and directions for treatment of, parasitic worms. According to Stewart (13), *Ascaris*, the big intestinal round-

worm, and the tapeworm, *Taenia*, received numerous and detailed consideration. *Ascaris* was the subject of 32 recipes. The Old World hookworm, *Ancylostoma duodenale*, seems to have been alluded to (2) (13), and the removal of the long, slender Guinea worm, *Dracunculus medinensis*, received detailed surgical directions. Although the microscopic blood fluke *Schistosoma haematobium* could not have been seen by the ancient physicians of the Nile Valley, they recognized its presence and its fateful progress, for the writer of the Ebers Papyrus admitted of no cure for it (13).

And so, Ancient Egypt had her cures, diagnoses and drugs for human ailments, frequently displaying brilliant perspicacity. It would be kind but negligent to omit some of the bizarre cures and ingredients used in this early outpost of civilization. Such questionable organic substances as dung of the cat, pig, sheep, pelican, fly or crocodile; or the blood of the goat, bat, calf and other animals; or the urine, bile, or saliva of man and various animals are suggested in the papyri. Many of these perhaps did not have the sanction of "organized medicine," but were merely employed in home cures and folk medicine. Some of them are mentioned in the Ebers Papyrus, but only 4% of the recipes (17) call for them. Perhaps the ultimate and the penultimate are to be found in the following fantastic therapeutics: the employment of powdered worms and pulverized mummies (11).

Although the Ebers document is scientifically highest of the papyri, and relatively free of magic, it contains specific incantations for various diseases and medical procedures. It is helpful for us to remember that the Egyptian mind was yoked with a fundamental premise that disease was often precipitated by the disfavor of the gods or deceased acquaintances (17). The physician's reputation rested high and dry regardless of the patient's fate: if the sick man was cured, the medico took full credit for his effective intercession; if he did not recover, then the destiny of the patient had unrolled irrevocably to the end.

Insect and rodent control received their due attention. There were recipes

for the prevention of bites by gnats and flies and even one to keep mice away. The latter ingeniously calls for cat fat and perhaps allows too generously for mouse intelligence and keenness of olfaction.

Thirst for understanding prompted a few breath-taking peeps into human physiology but no follow-through. Notably one key function is touched upon; then dropped: at the end of the recipes in the Ebers work "the physician's secret," or the movement of the heart, is referred to. And the connection of the heart to the limbs is slyly indicated when the writer states that it "speaks in the vessels of every member." Of course he was referring to the pulse.

Again we wonder why anatomy did not meet a modicum of attention and enjoy some progress, when embalming attained heights of perfection not approached before nor since. We lean heavily upon the report of Herodotus (18) who may be describing, not the most ancient methods, but those contemporary with him or immediately preceding his time.

... drawing the braynes out by the nostrills with a croked instrument of Iron, in place whereof they fill the Brayne pan with most sweete and pleasaunt oyntments. This done and finished, they cut and rip up the bowells with a sharp stone of Aethyopia, taking thereout the paunch and entrals, and clensing the belly with wyne of Palme tree; secondly, clens with fresh water mingled with most fragrant and delightfull spyces: in place hereof they force and stufte the belly it selfe with myrrhe, of the finest sorte brayed and pounded in a mortar. Likewise, with Cassia and all kinde of pleasaunt odours, except frankincense. Having thus done, they sowe it up agayne, and embalming the body, preserve it for the terme of 70 dayes: longer then which they may not keep it. The dayes expired and drawne to an ende, they take the corse and wash it over a fresh, annoynting the body with gum (which is to the Aegyptians in steede of Glue) and attyring it in a fine lynen drawne together with a lace, they send him back agayne to

his friends. His friends, in the tyme while the saliners have him in hand, procure an Image to be made to the likenes and resemblance of him that is dead, wherein being holow and vaulted within, they cause him to be inclosed, layinge both the Image and the body therein containd in a tounge together. Howbeit they which in meaner estate and fortune cannot reach so high, order the bodyes of their friendes in forme as followeth. First of all they fill a clyster with the oyntment of cedar which without any maner cuttinge or opening the belly, they strayne into the body by the inferiour partes and Fundament, preservinge the corse as before, 70 days. The last day of all they dreyn out the oyle from the bowels of the dead: which is of such vertue, that it bringeth out with it all the inner parts of the belly corrupted and festered. Herewith also they instil and power into the body Saltpeter, which is of force to deprave, taynt, and consume the flesh, leaving nothing but skin and bones: which done, they eftsones deliver the body to the owners. There is also a third kinde of usage accustomedly practised about the bodyes of the dead: that is any one be deceased whose friendes are very poore and of smalest substance, they only purge the belly, and preserving the corps with salt for terme of like time as before, in fine, redeliver him to the bringers.

And, yet for all the cutting, probing and sewing, no anatomical studies evolved. At least no charts, lists, descriptive paragraphs or other reflections of scientific anatomy are extant. It seems that human anatomy, like agriculture, was simply practical biology, mundane and pedestrian, whose minutiae was not marked for laborious recording. Those human experiences, remarkable in both quantity and quality, left to posterity no more insight into anatomy than did the daily chores of the wild horse butchers of Solutre France in Aurignacian times. The master-to-apprentice method of teaching-by-doing was evidently the practice in the embalming trade.

Late Egyptian rulers, the Ptolemies, allowed autopsies (19) but this was a

new era, comparatively modern, following the time of Alexander the Great.

Suggestions of scientific fervor shine through the perfunctory records, on at least one occasion, in the Smith Papyrus: Even when hopeless cases are encountered they are nevertheless completely and carefully described (17) for posterity, a departure from the practical surgery which was the objective of the papyrus.

Again Herodotus (18) throws up a few smoke signals to distract us. In the Egypt of his time he was particularly impressed by overspecialization among the physicians.

... every disease hath his severall phisition, who stryveth to excell in healing that one disease, and not to be expert in curing many: whereof it commeth that every corner is full of Physitions. Some for the eyes, some for the head, many for the teeth, not a few for the stomacke and belly.

According to Garrison (2), G. Elliot Smith insisted that no dentistry existed in Egypt, but Gorton (20) says that certain 7000-year-old mummies from Thebes possess gold-filled teeth and that the dental workmanship was excellent.

Sanitation seems to have warranted extraordinary consideration. Not only were emetics, purgatives, enemata, diuretics, diaphoretics and bleeding employed, but circumcision was common practice. Cleanliness was regulated by law (10). The home, the city and the person were the subjects of special sanitation statutes. Overeating was considered a great evil to one's health. Periodic purges were prescribed. Perhaps coincidence did not determine that the ibis was to become the sacred bird of Egypt; this fowl was believed to give itself an enema (1).

Priests not only set the example for cleanliness, but since they were practitioners and men of great prestige and authority, they caused personal hygiene to meet everyday acceptance. The priests themselves often and regularly changed to freshly laundered clothing and they were careful to "shave their bodies every third day; wash themselves twice a day and also at night" (8).

These same exemplars of personal cleanliness assumed the role of meat inspectors. Priests examined the carcasses of domestic animals before the populace could accept them for food. First, external irregularities and symptoms were sought; then the mouth and tongue were inspected (8). We are not quite sure what these wary experts sought nor what they found, but they may have known certain labels of infection, again too commonplace to record. No blue stamp of acceptance was employed here; a permanent brand or notch on a horn remained for all to see when inspection was passed.

The sacred bull, considered the reincarnation of the god Osiris, held an honored place in old Egypt (15). Not alone was he apartmented in the great temple of Memphis, but he was solicitously cared for by a corps of servants. When his "spirit" was whisked away his name was faithfully recorded in the genealogical archives reserved for Pharaohs and bulls, and his hulk of beef and gristle was ceremoniously sealed intact, or embalmed, in a sarcophagus. Sixty such sarcophagi have been found, each a polished granite creation carved from a 70-ton monolith (15).

Other manifestations of the feeble flame of Egyptian biology are in evidence in scattered practices and writings. Bread, beer and leather required not only luck for their first manufacture, in pre-dynastic Egypt, but these products entailed microbiological processes which had to be maintained and somewhat standardized. They were probably not reduced to writing, and did not constitute sciences.

Tomb carvings in the Nile basin disclose still more practical biological interests. Dogs, donkeys, sheep, and cattle were often depicted. There seems to have been a marked interest in the horn-polled characters of the latter (14), and this suggests more than a casual interest in bovine phenotypes. Mural sculpturing also included wheat as an object of honor and respect. The bean was notably absent because it was declared unclean (8).

And so, Egypt, old and honored, contributed data, primarily anthropocentric, to the new body of biological facts.

No great principles were unlocked from Nature's chest of secrets but some new biological data, diffused and admixed with mental detritus, were recorded. And they were recorded more extensively here than in Mesopotamia because Egypt had invented the more usable writing medium, papyrus.

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The United States Office of Education has found that eighty per cent of the nation's college students attend institutions within their own states. Less migration was found in those states where educational facilities were read-

ily accessible to the majority of students. New Jersey, Connecticut and Delaware retain the smallest proportion of their residents, while California, Texas and Utah retain the highest.—*The New York Times*.



The number of colleges and universities in the United States increased 9.4 per cent in the last decade, from 1,708 to 1,868. Student bodies have increased 78 per cent. Faculty staffs have increased 67.9 per cent, from 146,929

to 246,722. The increase in male students has been 107.4 per cent—from 893,250 to 1,853,068—and in women 34.1 per cent, from 600,953 to 805,953.

—*Chicago Daily News*.



THE LIFE AND WRITINGS OF JOHN STERLING KINGSLEY (1854-1929)

By HARLEY J. VAN CLEAVE

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John Sterling Kingsley was one of that rapidly dwindling group of American general zoologists and naturalists. He began his career as a scientist before the advent of high specialization in the fields of science, at a time when all zoology rested on a foundation of taxonomy and morphology. It is true that rudiments of many of the newer fields are recognizable as in retrospect we trace back their history, but none of these beginnings had as yet become recognized as a distinct field. In that day it was possible for an active mind to master the entire content of zoology and to be recognized as a naturalist, competently trained in all the currently developed fields of science. As

the science of zoology began to expand, the earliest superstructure added to the foundation of gross morphology and taxonomy was but a reevaluation of the concepts of structure, development and evolution. It was Dr. Kingsley's privilege to be an interested observer in the period when newer disciplines were developing in the expanding realm of modern zoology. He had a keen appreciation for the values inherent in the experimental, theoretical and philosophical aspects of modern biology although he seemed to prefer to continue to cultivate the fields where he had established a lasting reputation. In his own research and writing he demonstrated an especial appreciation for the importance of the facts of embryology and morphology in the explanation of vertebrate evolution.

It is rather strange that so little has been recorded regarding this important figure. It is the purpose of this article to give a brief account of his life, training and experiences and then to supplement this material with the first attempt at compiling a complete list of his diversified program of publication.

Shortly before Dr. Kingsley left Urbana he gave me an unsigned holograph copy of an autobiographical sketch, clearly recognizable as in his own hand. In this he calls himself a naturalist and traces the early development of his interest in nature, stating that in the small town of central New York where the family lived there was at that time not the slightest interest in or encouragement for the study of science. Even under this unfavorable environment the boy early became absorbed in the study of nature. At the age of six he wrote his father a letter in Roman capitals telling of and graphically describing a ring-neck snake which he had acquired. He be-



*J. Sterling Kingsley
at his desk*

came a collector of stones and of bird eggs. Inspired by the annual visits of a travelling collection known as Haight's Museum he vainly endeavored to stuff eviscerated animals, unaware of the fact that muscles must be removed and the skin preserved. Naturally, his preparations were not very permanent. At the age of twelve he was acutely interested in chemistry and became a subscriber for the *Boston Journal of Chemistry*. It was with a background of interest of this sort that he later decided to become a zoologist and naturalist.

John Sterling Kingsley was born in Cincinnati, New York, on April 7th, 1854. When he was two years of age his family moved to Norwich, New York, where his father presided as Judge of the Chenango County Court. The boy showed an early interest in engineering and was offered an appointment to the Naval Academy at Annapolis. After declining this appointment, he entered Brooklyn Polytechnic Institute, but the death of his father caused an interruption in his education. He accepted employment as a civil engineer in surveying parties working for two different railroads. In 1873 he entered Williams College as a junior, where he received training in anatomy and natural history. During his residence he became assured that his interests lay primarily in the field of natural history rather than in medicine. When he graduated from Williams in 1875 there were no regularly recognized graduate departments in zoology in the United States. He went for a while to the Peabody Academy of Science in Salem, Massachusetts, to study insects under Professor A. S. Packard. There he soon became a curator and held that position for two years (1876-1878).

In the years 1877 to 1880 he assisted in the work of the United States Entomological Commission. It was during that period that he began publishing taxonomic studies and lists of Crustacea. In 1879 he became associated with the Philadelphia Academy of Natural Sciences, where his interests in morphology had their origin.

For the year 1881 he served as curator of the Worcester, Massachusetts, Natural History Society, resigning to

take over the editorship of the *Standard Natural History*. Work on this project extended from 1882 to 1885. At the same time he assumed editorship (1882-1883) of the newly founded periodical, *Scientific and Literary Gossip* which was published in Boston. After completing work on the *Standard Natural History* Dr. Kingsley edited two other general works, the *Riverside Natural History* (1888) and the *Popular Natural History* (1890). Experience which he gained in writing and in editing these encyclopaedic works laid the foundation for his broad comprehension of scientific material and ability as a writer and editor. Apparently growing out of this experience his advice to young men entering the biological profession was the oft repeated admonition to write, revise and rewrite the material which interested them. It was his firm belief that power of expression comes only with the attentive practice in the art of composition.

On January 31, 1882, at the beginning of his editorial work, he married Mary Emma Read, who shared his interests in travel and culture. While he was on the faculty of Tufts College they spent many of their summers in Europe. His kindly spirit, extensive travels and broad experiences made him a man of charming personality with an unlimited supply of anecdotes and an irrepressible sense of humor. Democratic almost to a fault he held little respect for pretence on the part of others. Throughout life he was unimpressed by individuals who attempted to assume an air of unwarranted importance and with quiet but firm dignity he could quickly put such an individual in his proper place.

In the early days of his training, Professor Kingsley became a skilled draftsman and artist. As a young man he learned the printer's trade while serving as a "printer's devil." Thereafter his interests in the arts of printing and preparation of illustrations never waned. He developed graphic powers of direct expression which served him well as an editor, writer and teacher. He drew parts of the stones for the lithographic plates in the distinguished Hayden reports on the Geological and Geographical Sur-

vey of the Territories.

Through his student years he was often hired to prepare drawings for articles and books. Later he illustrated his own textbooks and scientific publications with exceptionally fine drawings. As a teacher he was a master at the blackboard, deftly using a crayon in each hand to sketch simultaneously the intimate details of any symmetrical structure as he described it to the class.

Throughout his later life he seemed to find relaxation in the use of the pencil, pen and brush. In fact over a long period of years he accumulated the drawings to illustrate his last great work, *The Vertebrate Skeleton*, which was not published until after his retirement. While the manuscript of this book was in preparation, the drawings were destroyed in the disastrous Berkeley fire but because of his ability with the pen he was able to replace all of them with but relatively little delay to the publishers.

In 1885 he received the degree of Doctor of Science from Princeton for a thesis on "*The Embryology of Limulus*."

In 1886 he became one of the associate editors of the *American Naturalist*, one of the leading American periodicals of that day. At that time A. S. Packard and Edward Drinker Cope were the editors in chief. The following year Dr. Kingsley replaced Dr. Packard as joint editor with Dr. Cope and he held that position for ten years. He and Cope not only passed upon the articles submitted to the *Naturalist* but they likewise contributed profusely, preparing editorial communications and reviews of scientific works and timely comments. Often these contributions were printed without designating which of the editors was the author. Dr. Kingsley's experience as author and editor finally led to his being selected as editor of the *Journal of Morphology* (1910-20), where he succeeded Professor C. O. Whitman, the founder of that renowned periodical. Incidentally, the initial number of the *Journal of Morphology* contained Dr. Kingsley's contribution on the Compound Eye of Crangon and later volumes included his papers on the Em-

bryology of *Limulus* which were very widely acclaimed.

Professor Kingsley's first teaching was in Indiana State University (1887-89), where as Professor of Zoology he became associated with David Starr Jordan and Barton W. Evermann. He left Indiana to accept the position as Professor of Agriculture and Biology in the University of Nebraska (1889-91). There he became Dean of the Faculty and was elected the first president of the Nebraska Academy of Sciences. In his reminiscences I well remember his narration of a difficulty encountered at Nebraska in securing teaching material. One of his early orders was a requisition for the skeleton of a man and the skeleton of a pig. For a time the administration refused to place the order because the skeleton of a pig was quoted at a price higher than that for a human skeleton. This was about the time that his interests began to shift from the invertebrates and general natural history to the field of vertebrate anatomy. Apparently aware of a need for further background in that field, he left Nebraska in 1891 to become a student of Professor Wiedersheim, the leading authority in the field, at the University in Freiburg, Germany.

He remained in Europe one year and on his return to America he accepted a professorship at Tufts College, Massachusetts (1892-1913). Through twenty-one years of teaching and research, he found himself becoming progressively more involved in the details of administration, which included his serving as Dean of the Graduate School.

In 1913 the chair of vertebrate anatomy and embryology in the University of Illinois became vacant. Dr. Kingsley, as one of the most widely recognized authorities in the field, was asked to recommend a candidate for this position. He urged the appointment of Dr. Herbert V. Neal, then Professor of Biology at Knox College. The administration at the University of Illinois never questioned Dr. Neal's ability but they had decided that they wanted a man who was already established as an acknowledged leader in the field. Following a few preliminary inquiries the post was tentatively of-

ferred to Professor Kingsley with little assurance that he would accept. However, after outlining certain reservations regarding his personal obligations, he came to Urbana to investigate the position. He asked that he be not required to serve on committees and, if I remember the details correctly, he also specified that he should not be required to attend faculty meetings. The stipulation against serving on committees was purely a protective device, for he became one of the most valued members on committees where he could serve with the greatest efficiency. He took particular delight in the Library Committee, where his familiarity with the world literature enabled him to see loopholes in the library files. When he transferred his residence to Urbana, the University of Illinois secured the services of an illustrious teacher and citizen of the world for eight years of his most mature career. Incidentally, as proof of his confidence in the ability of Professor Neal, the latter became Kingsley's worthy successor at Tufts.

Professor Kingsley's influence in the University of Illinois became widely felt. He was always an inspiration, especially to the younger members of the faculty, and he exercised great influence upon the level of graduate teaching. However, his results with the undergraduates were particularly outstanding. Premedical education had come to be regarded by the students as a mere obstacle which had to be overcome before they could begin the study of medicine. Under his wise counsel a professional interest was instilled in the premedical group, marking a distinct break with attitudes of the past.

Many of the zoologists of the present generation received sound basic training in their chosen field through the pages of the Kingsley translation of Hertwig's *Manual of Zoology* (1902 et seq.) long before the much publicized "Principles" courses had been developed. Although this book was chiefly a treatment of morphological detail against a taxonomic background, the extent of sound biological materials included in its pages will surprise any modern student who is willing to read a few chapters. Naturally, many of the strictly modern branches of zoology

are untouched in this volume but the points of view were usually well advanced for the period when the text was written. Although Professor Kingsley personally attempted to keep well informed on the newly developing aspects of zoology, he never felt impelled to regard himself as an authority in the newer fields and never attempted to enter these with his own program of research.

Several generations of premedical students will remember him particularly for his series of laboratory Guides to Vertebrate Dissection (1907) and for his Comparative Anatomy of the Vertebrates (1912), which were long recognized as standard works.

One aspect of Professor Kingsley's interest and activity so permeated his entire professional life that it seems best to consider it as a separate section rather than attempt to integrate the events into the chronological treatment of his life and experiences. This concerns his connections with various marine biological stations. Very early in his career he cooperated in establishing at Beverly, Massachusetts, a biological laboratory for the study of marine life. Later he became director of the Annisquam Laboratory, which had been founded by Professor Alphaeus Hyatt in 1880. During the summers of 1889 and 1890 he served as a member of the teaching staff of the Woods Hole Marine Biological Laboratory. Dr. Kingsley became increasingly interested in the distinctive Arcadian fauna, an interest which led him in 1898 to establish a private laboratory at South Harpswell, Maine. At first considerable attention was devoted to classwork but after 1905 class instruction was suspended and the laboratory became devoted wholly to research.

It was in that laboratory that the writer made his first personal contacts with Professor Kingsley. As a graduate of an inland college, wholly ignorant of the ocean and its living fauna, the writer undertook to fulfill the duties as collector for the laboratory. With limitless patience and personal interest, which later became recognized as distinctive of the man, he taught me the anatomy and physiology of the single-cylinder engine of the "Perky" and gave me instructions on the tides

and on navigation. He told me where and how to collect *Cerebratulus* in the clam flats, how to pick up the large blue jellyfish, *Cyanea*, from the waters of Casco Bay and how to recognize the minute colonies of *Clava* sheltered in the mats of *Fucus* at low tide. He and Dr. Neal, the assistant director, gave me instructions on how to remove the egg candles from the dogfish and how to dissect and preserve the embryos for research purposes. Later, when Professor Kingsley and I became colleagues on the same faculty, it became evident that these graciously helpful attitudes were the unstudied result of a generous kindness toward those with whom he became associated.

In 1921 the Harpswell Laboratory was reorganized and its seat of operation was moved to Mount Desert Island where it still functions as the Mount Desert Island Biological Laboratory.

Professor Kingsley retired from active teaching in the University of Illinois in 1921. With his family he then took up residence in Berkeley, California, where he was given research space in the University laboratories. Here again he demonstrated his ability to be transplanted to new situations as he had done when he moved from the East Coast to Illinois. At Berkeley he completed his volume on the Vertebrate Skeleton (1925), his last major publication.

In 1929, with his daughter Mary, he began a world cruise which he prophetically declared to be his "last great adventure." A few days out of Yokohama, August 29, 1929, his lifeless body was found in his berth with an open book beside him. The method of his passing and his burial at sea were a fitting close to a life which had known such far flung horizons and had left such a widespread and lasting imprint on the history of his chosen field of science and on the memories of his associates.

A Chronological Listing of the Publications of John Sterling Kingsley*

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* Many of the editorial articles and comments in the pages of the American Naturalist are without title and appear under a caption bearing the names of E. D. Cope and J. S. Kingsley as editors. The subjects of these articles are given in parentheses. Many brief news items in the editorial section have been omitted in the compiling of this list. Except where articles appear in the same publication, there has been no attempt to arrange the titles in proper sequence within each year.

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 Class III. Cyclostomi. Ibid. 3:65-67.
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BACKGROUND TO SCIENCE

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Ever since man appeared on earth, he has wondered about the world he lives in. What animals and plants and things are in it? What are they like? What do they do? Where do they come from? What are they here for? What are *we* here for? What is the purpose of it all?

Man has always been able to find satisfactory answers to these questions, but the answers have not always been the same. His explanations of the cosmos have varied with his experience, background and degree of sophistication.

Progress in knowledge is simply increase in the amount of correlation man has been able to recognize between events. In prehistoric times, his experience was too limited to permit much correlation. He had not accumulated enough data. He could make few generalizations because, to him, most phenomena were isolated experiences.

Primitive man was not stupid, however. Using what information he had, he was able to develop an entirely satisfactory explanation of his world. He simply endowed all things, both animate and inanimate, with souls. Everything had its own spirit or god. Animals, of course, had anthropoid minds; so, too, did plants, and even sticks, stones, mountains and brooks. Consequently the world was ruled by caprice.

The early cosmogonies, like succeeding ones, were rationalizations of the prevailing beliefs. In ancient Babylonia, the idea that the stars influenced human destinies became elaborated into a religion. This notion caused the priests to spend a great deal of time watching the sky and pondering on what they saw. They quickly recognized certain cycles. Day alternated with night, the moon waxed and waned, and the year passed through its seasons. The priests coupled these changes

with changes in the positions of the stars. They also worked out the relations of the stars to each other, and developed mathematics considerably in doing so.

A few stars, however, failed to obey the laws which governed their fellows. They wandered erratically over the sky. At last, in the 8th century B. C., it was discovered that these wandering planets actually obeyed laws of their own.

The impact of this discovery must have been as great as that of Einstein's announcement of his theory of relativity. At last the motions of all the heavenly bodies were explained, and everything fell into place. Science surged forward. Eclipses were predicted, and the pseudoscience of astrology was developed further.

In Egypt the idea of cycles in nature took another turn. Instead of being coupled with astrology, it was associated with the idea of resurrection and the obsession that the physical body must be preserved after death. Because of these religious views, the Egyptians gave their attention to different studies than the Babylonians.

The annual cycle in Egypt was tied closely to the annual Nile flood. Grain was the basic Egyptian food, and its sowing and harvesting were correlated with the stages of the Nile. Because the river's annual floods wiped out boundary lines, the Egyptians were forced to develop methods of measuring land, and out of these grew the science of geometry. The Egyptians were also able to predict the time of the floods, and to estimate the size of the harvest from the height to which the river rose.

The Egyptian religion combined the idea of cycle with that of resurrection. The elaborate story of the annual death and revival of the god, Osiris, is

an analogy with the growth and death of crops.

The Egyptians knew that frogs developed from tadpoles, and they worked out the developmental cycle of the scarab. The scarab is a dung beetle. Its adult makes a ball out of a piece of cow manure, lays an egg in the middle, and pushes the ball around with it. The egg hatches into a larva, which eats away inside the manure until it has grown large. Then it passes through a motionless pupal stage, during which it changes into a beetle. Finally the adult beetle emerges from the pupa and the ball of manure.

The resurrection theme is obvious—out of decay comes life—and the scarab with its ball of manure became the symbol of resurrection. Scarab amulets were more abundant in ancient Egypt than lucky charms are now; they are for us the symbol of that civilization.

In order to preserve the body after death, the Egyptians developed the art of embalming, and incidentally learned something about anatomy. Most of the body's organs were known and named. The most important one was the heart, which was considered to be the organ of thought and feeling. It was thought to be connected to the rest of the body by a series of vessels which carried blood, urine, tears, sperm, and even feces. The analogy with the canals which gave life to Egypt is clear.

These three cosmologies—the animistic, the Babylonian and the Egyptian—were all completely satisfactory to their peoples. They were logical, they were consistent, and they explained the known facts. Truth is relative; for their times they were true. But as new facts became known, these cosmologies became unsatisfactory.

All three had one thing in common—they all invoked the supernatural. The Greeks took a great step forward when they omitted it.

It is an interesting fact that Greek philosophy did not arise in Greece proper, but in the colonies which the Greeks founded in other lands. Greece itself became a home for philosophers only after it had passed its political peak. Aristotle, for instance, lived in

Athens long after the Golden Age of Pericles, at a time when all of Greece had been subdued by the semi-barbarian conqueror, Alexander. Still later, the home of Greek thought was Alexandria, in Egypt. This was where the great Greek geometrician, Euclid, lived.

In the sixth and seventh centuries B. C., the rulers of the Ionian cities on the coast of Asia Minor were merchants interested in expanding their businesses. Slavery was practiced, but was not so far advanced that manufacturing technics were looked down on as they were later on. One of these Ionian cities was Miletus, a thriving, productive community. It traded with Egypt and Mesopotamia and with its own colonies on the Black Sea.

In Miletus a group of philosophers arose who were not divorced from the world, but were men of affairs. Because they were practical men and because of their political environment, they were able to develop their new ideas. Miletus was small, and its inhabitants were citizens, not subjects. In Egypt and Babylonia, with their great numbers of serfs, superstition was an invaluable tool for governing the people; in Miletus it was unnecessary.

The first Greek philosopher of whom we know was Thales, who lived in Miletus between 650 and 580 B. C. He was a business man, and made a fortune in olive oil. He visited Egypt, where he learned geometry. Returning home, he adapted the Egyptian land mensuration technics to determining the distance of ships at sea. He studied the Phoenician methods of navigation by the stars. He also studied Babylonian astronomy, and was able to predict an eclipse of the sun in 585 B. C.

These accomplishments were not striking. They showed merely that Thales was a bright student and knew many things. Thales' great contribution was his cosmogony. He was the first to break away from superstition and offer a rational explanation of the universe.

According to Babylonian mythology, the world was at first covered by the sea. The Creator was Marduk. Marduk made a rush mat; he made dirt, and

piled it beside the rush mat. Thus the land appeared.

Thales took over part of this myth, but considered Marduk to be an extra, unnecessary cogwheel in the series of events, and dropped him out. Thales' theory was, then, that at first the world was all water, and that the earth had been formed from it by a sort of silt-ing-up process. This idea was probably derived by analogy from the way new land was formed in the Nile delta. Its predecessor, the Marduk myth, had been derived from similar action in the rivers of Mesopotamia.

Thales thought that the earth was a flat disc floating on a vast ocean. Rain he accounted for by supposing that the water of the ocean continued in the sky overhead. He thought the sun, moon, and stars were incandescent vapor.

A younger contemporary of Thales in Miletus was Anaximander, who lived from 611-546 B. C. While Thales had considered water to be the source of everything, Anaximander disagreed. He said that there were four elements—earth, mist, fire and water—but that they were all simply forms of a single substance, which he called "aperion." This he defined as the quality-less, the indeterminate, the unbounded. Aperion produced heat and cold, which acted together to form water, and from water came earth, mist and fire.

According to Anaximander's theory, the four elements were stratified at first. The earth, being heaviest, was in the center. It was covered with water, which was covered with mist, and the mist by fire. The fire heated the water, making it evaporate, and land appeared. The water became mist, but its pressure became so great that it burst the fire layer. This layer then broke up into a number of fiery wheels, each enclosed in a tube of mist, which circled around the earth. The sun, moon and stars were thought to be simply holes in the tubes through which one could see the fire inside. Eclipses were explained as partial or complete closing of the holes.

Another Milesian philosopher was Anaximenes, who died in 494 B. C. He thought that mist was the first principle. As the mist became more and

more condensed it formed water, and then earth. Fire was the result of its rarefaction.

Heraclitus (510-450 B. C.) of Ephesus, also an Ionian city, disagreed with his predecessors, and thought that fire was the first principle.

A different theory was proposed by Pythagoras, who died about 500 B. C. He was born on the island of Samos, which lies off the coast of Asia Minor. The Persians conquered Ionia about 530 B. C., and Pythagoras decided that Samos would be next. So at the age of forty he migrated to Croton, a city in southern Italy. He was not only a philosopher, but also a politician and a religious reformer. He established a school—an ascetic Brotherhood—for the study of mathematics and of the Pythagorean philosophy.

For the Pythagoreans, Number was everything. It was not only the form but also the matter of the universe. Their theory of numbers was therefore not only a mathematical theory but also a physical one. A point was 1, a line was 2, a surface was 3, a solid was 4. Furthermore, the Pythagorean point was solid, not the bodyless abstraction which a point is to us. These points could be added to form lines, lines could be added to form planes, and planes could be added to form solids.

Pythagoras thought that the earth was spherical and that it revolved around a primordial fire—not the sun—which was the center of the cosmos.

Pythagoras' ideas were widely accepted, and a school of mysticism developed among his followers which survived a long time. Our own superstition of numerology stems from Pythagoras.

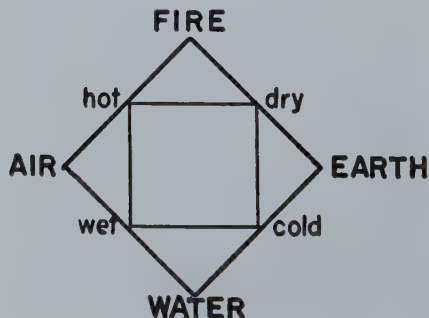
The Pythagoreans dealt only with whole numbers. They believed that everything was divisible into whole numbers. This had to be true according to their theory, since points, no matter how small, had bulk. It was a tremendous shock for them, therefore, when in the fifth century B. C. someone discovered the so-called "irrational" numbers. The basic discovery was that if the side of a square was a whole number, its diagonal could not be. And if the diagonal was a whole number, the side could not be. Hence

the side and the diagonal are incommensurable. If length of the side is considered to be 1, the length of the diagonal is the square root of 2. And the square root of 2 is an irrational number. Because of this, a line must be infinitely divisible, and the points of which the Pythagorean universe was built cannot exist.

Still another theory was presented by Anaxagoras (500-428 B. C.), who was born in Clazomenae, Ionia, but settled in Athens under Pericles. He thought that there was an infinite number of elements. One of his ideas was that wheat contains tiny amounts of bone, blood, flesh, skin, hair, etc., and that when we digest it we simply sort out these substances.

Of these early philosophers, the one who had the greatest effect on posterity was Empedocles. He was born in Akragas (now Girgenti), Sicily, and lived in the fifth century B. C. Thales had thought that the first principle was water, Anaximander that it was *aperion*, Anaximenes that it was mist, and Heraclitus that it was fire. Empedocles synthesized the views of his predecessors, and worked out the theory of the four elements. This theory was so satisfactory that it was accepted for the next two thousand years.

The four elements were earth, air, fire and water. Associated with these were four qualities, hot, dry, wet and cold. Fire was hot and dry, earth was dry and cold, water was cold and wet, and air was wet and hot. These relationships are shown diagrammatically:



was fire; the smoke, which vanished in the air, was air; water came boiling out at the end of the stick away from the fire; and the ash which remained was earth. Thus, when the wood was burned, the four elements of which it was composed separated out.

Associated with this theory of the four elements was that of the four humors. This theory explained the composition of the body, its physiology, and its diseases. The four humors were blood, black bile, yellow bile and phlegm. Each humor was derived from an element: blood from fire, phlegm from water, black bile from earth, and yellow bile from air. The humors were manufactured in different parts of the body: blood by the liver, phlegm by the lungs, black bile by the spleen, and yellow bile by the gall bladder. It may be wondered why the spleen, which is not too prominent an organ, should have been selected as the source of black bile. However, as Sigerist points out in *A history of medicine*, the theory of the four humors was developed in a country where malaria was endemic, and where the spleen was often tremendously enlarged.

The body was considered to be a mixture of the four humors. Differences between individuals were due to differences in the proportions of the humors which composed them. There were four principal temperaments, each due to a proportionately large amount of one humor or another. We still use the words which describe them—sanguine, choleric, melancholy, phlegmatic.

If the proportions of the humors varied beyond certain limits, they became unbalanced, and disease was the result. The patient could be cured by bringing the proportions back to normal. This was the theoretical basis for the practice of phlebotomy or blood-letting. The physicians could not add any of the humors to the body, neither could they do much about drawing off excess black or yellow bile. The body itself eliminated phlegm when too much was present, as in a cold. That left the blood. And since it was a simple matter to take away some blood, bleeding became the most common therapeutic measure.

Democritus, who lived about the same time as Empedocles, developed an entirely different explanation of the universe, also on the basis of natural causes. We know of his ideas because they were taken up by Epicurus and his followers, and described by the Roman, Lucretius, in his poem, *On the nature of things*. Democritus believed that everything was made up of atoms, tiny invisible particles. We know now that he was much closer to the truth than Empedocles, but only a handful of people thought so between his time and the modern period. Empedocles' synthesis was more convincing.

Nowadays Democritus is praised for his remarkable insight, but I see no reason to do so. He had no more factual basis for his theories than did any of the other Greek philosophers. So many different systems were proposed that on the basis of pure chance one of them was bound to hit pretty close to the mark . . . Everything has been said before by someone who didn't understand what it meant.

Neither Socrates (469-399 B. C.) nor his pupil Plato (427-347 B. C.) was a scientist. In fact, Plato's philosophy was essentially anti-scientific. Plato founded the Realist school of philosophy. According to this school, ideals have actual existence, they are real. Somewhere—not on this earth—there is to be found the perfect form of every material thing and of every human conception. Here on earth are only imperfect copies of these perfect models, but in that unknown Someplace there exist a perfect chair, a perfect table, a perfect dog, a perfect man, a perfect beauty, a perfect justice, etc. The anti-scientific implications of this view are obvious—why should we concern ourselves with the imperfect things here on earth when we can engage in noble and lofty speculation on higher things?

Greek science reached its peak with Aristotle, probably the greatest of the ancient Greeks. He was born in 384 B. C. at Stagira, a small town on the Macedonian frontier. His father was physician to the king of Macedonia. When he was seventeen, Aristotle was sent to Athens, where he studied under Plato. When Plato died in 347, Aristotle expected to succeed him, but was disappointed. This isn't surprising, since

most of Aristotle's ideas were opposed to those of Plato.

Aristotle left Athens and went to the coast of Asia Minor, where he lived at the court of a minor king and studied many marine animals. In 342 B. C., when he was 42, he went to Macedonia to become the tutor of Alexander the Great. When Alexander became king in 336 B. C., Aristotle returned to Athens, where he founded his own school, the Lyceum. Here he did most of his philosophical writing. He died in 322 B. C. at the age of 62.

Aristotle was a universal genius. His writings, which cover almost the whole gamut of knowledge, fall into four groups.

His first and earliest writings were in the field of physics. They show more of the influence of Plato than the later ones, and are not considered particularly good. A second group comprised ethical and political writings, included in which were several important works.

The third group of his writings included logical and metaphysical works. In these he set up the basis of modern logic, and criticized Plato's ideas. He originated the Nominalist school as opposed to the Realist one. He denied Plato's notion that perfect models of objects and qualities actually existed. They are merely ideals, he said. As we should say, they are simply abstractions.

We are most concerned with Aristotle's biological writings. The principal ones were *On the soul*, *Histories about animals* (i.e., *Natural history*), *On the generation of animals*, and *On the parts of animals*. In these books, Aristotle compiled all that was known about animals. He wrote about over five hundred species. He dissected many of them himself, and made remarkably detailed and thorough observations, not only on their anatomy, but also on their ecology and habits.

An idea which we owe to Aristotle is the notion that everything was made for a purpose, that it must be of some use to man. Even now we hear people ask, "What use is a mosquito?" or "What good is poison ivy?" Why these should be of any use to us is a question these people never think of asking themselves.

As late as the nineteenth century (and for all I know, even now) it was held that the reason man had a beard was to protect his chest against the cold blasts of winter. The fact that women have no beards is easily explained. Men work outdoors and need extra protection; woman's place is in the home, so they don't need it. A British pamphleteer even wrote in 1860 that men who shaved were acting against the design of God.

Aristotle's successor in the Lyceum was Theophrastus, a botanist. His *Enquiry into plants* gives a large amount of detailed information about a group to which Aristotle had paid little attention. He can be said to have founded the science of botany.

Theophrastus' successor as head of the Lyceum was Strato of Lampascus (d. 269 B. C.). His writings have been almost entirely lost, but from the fragments we have of them, we can conclude that he must have been a brilliant and remarkable man. Alone among the ancients he stressed the importance of the experimental method in solving scientific problems, and carried out many experiments himself. He was famous and honored; he was the teacher of Erasistratus, a luminary of the famous Museum at Alexandria, and of Ptolemy II; yet his point of view was never accepted by Greek or Roman philosophy and he himself was so forgotten by later generations that even now some scholars state categorically that systematic experimentation did not exist in ancient Greece.

Strato pointed the way that modern science has taken. Why was it not followed at once?

Two reasons can be mentioned. The first resulted from the political situation. In order for philosophy to flourish, men must have leisure and security. Life cannot be so precarious and food so uncertain that they must spend their whole time trying to keep alive. But after 323 B. C., when Alexander died of malaria and alcohol, a period of disorder ensued. Three of his generals divided his empire. The cultured and intelligent Ptolemy took Egypt. Seleucus took most of the old Persian empire and founded the Seleucid dynasty, while Macedonia and Greece fell

to Antigonus. His rule lasted but a short time, after which the kingdom fell into pieces. The pieces fought continuously among themselves, and Greece was never again important. The people who had produced the world's greatest thinkers were unable to learn how to live peaceably with each other.

The second and far more important reason was the Greek attitude toward manual labor and toward slavery. Greece was a country of free men and slaves, of citizens and ciphers. Slavery was much more prevalent than it had been in the time of Thales, and the things that slaves did were considered beneath the dignity of free men. Xenophon put it clearly in his *Oeconomicus*:

"What are called the mechanical arts carry a social stigma and are rightly dishonoured in our cities. For these arts damage the bodies of those who work at them or who act as overseers, by compelling them to a sedentary life and to an indoor life, and, in some cases, to spend the whole day by the fire. This physical degeneration results also in the deterioration of the soul. Furthermore, the workers at these trades simply have not got the time to perform the offices of friendship or citizenship. Consequently they are looked upon as bad friends and bad patriots, and in some cities, especially the warlike ones, it is not legal for a citizen to ply a mechanical trade."*

The later Greek philosophers, Aristotle and Plato included, had grown up in a society in which slaves were considered inferior by nature, and in which the things they did were also considered inferior. They accepted this attitude without question and it biased their whole thinking.

Because of this taboo on working with their hands, most Greek philosophers simply observed their world and then leaned back and theorized. They made little attempt, other than polemic, to disprove their opponents' theories or to prove their own, so progress was impossible.

For all its remarkable political and engineering structures, Rome gave us

*Translated by B. Farrington in *Greek Science. I. Thales to Aristotle*.

almost nothing new in science. The Romans apparently lacked intellectual curiosity. They simply took over the Greek knowledge, and let it go at that.

Two exceptions to the above statement were Pliny and Galen. Both were prolific writers, and both had a great effect on posterity. Their works were not lost during the Middle Ages, and their writings, together with those of the botanist and herbalist, Dioscorides, and later of Aristotle comprised the corpus of biological and medical knowledge during that time.

Pliny (23-79 A. D.) was the first encyclopedist. He is said to have written 102 books, of which only his 37-book *Natural history* has come down to us. It is good reading even now. It was not written for the learned, but for ordinary people, so that its style is easy. Pliny made few original observations, but compiled his information from the writings of others.

The last great biologist before the Renaissance was the Greek, Galen (131-210 A. D.), who practiced medicine in Rome and was the personal physician of the emperors Marcus Aurelius and Commodus. He wrote 256 books on philosophy, mathematics, grammar, law and medicine. Of the 131 medical ones, we still have 83. He dissected sheep, cattle, swine, dogs, bears, apes, and other animals, but not man. His anatomical descriptions were really excellent for his time, and his physiological theories were at least consistent and satisfying.

The transition from the intellectual virility of Greece through Alexandria and Rome to the virtual catalepsy of the Middle Ages was a slow and gradual one. As the Roman empire disintegrated, so too did the sum of human knowledge become less. Most of the writings of the ancient world were destroyed, lost or forgotten, and no one cared.

There were a few practical inventions, during the Middle Ages, but they were made by artisans, not by intellectuals. Typical of these inventions was the horse collar (although some say that this was actually invented in China and merely introduced into medieval Europe). In ancient Greece and Rome, horses are used for riding and

for pulling small chariots. Even though the latter were small and carried only one or two men, they required two to four horses to pull them. The reason was that the horses were harnessed to the chariot by a set of straps, one of which passed right across their throats. When they pulled, this strap pressed against their necks, and if they pulled too hard their respiration and blood circulation were interfered with. One horse with a horse collar was worth more than four with a choke-strap. Horses could not be used successfully as draft animals before this invention. Other medieval inventions were the rudder and the mechanical clock. Near the end of the period came the mariners' compass and the art of printing from movable type, both of which contributed greatly to the downfall of the medieval world.

It is hard for us nowadays to understand the medieval mind. It is more alien to us than the Greek or Roman ones. This was a time in which the thinking of all people was orientated toward religion. A single religious belief dominated western Europe. The faith is still the same today, but many of the ideas associated with it have changed. Particularly during the earlier centuries of this period, life on this earth was not considered important. It was simply a preparation for the life hereafter. Everything one should know and do to enter that paradise had already been written down in the Bible and interpreted by the Church. The path to Heaven was clearly marked. Therefore why bother with mundane things?

The position was set forth clearly by St. Ambrose about 389 A. D. when he said, "To discuss the nature and position of the earth does not help us in our hope of the life to come. It is enough to know what Scripture states."

What did Scripture state about the earth? A monk named Cosmas figured it out around 550 A. D. in his *Christian opinion concerning the world*. The world was a flat rectangle, extending twice as far east and west as north and south. In the center was the earth, around which was the ocean. Beyond and around the ocean was another earth, where the Garden of Eden was located and which had been the home

of mankind before the Flood. In the north was a high mountain around which the sun and moon revolved; night fell when the sun went behind the mountain. The sky was a huge dome whose sides came down to the edge of the outer earth, and above it was another ocean, "the waters that are above the firmament."

In addition to the Bible, the Middle Ages recognized a few other authorities. Aristotle's works were at first unknown, but Galen, Pliny and Dioscorides were available. It was felt that all necessary facts about nature and medicine were contained in their works.

When the writings of Aristotle, which had been preserved by the Arabs, were rediscovered around 1000 A. D., there was quite a flurry in the Church. Finally St. Thomas Aquinas (1225-1275 A. D.), one of the greatest philosophers of all time, correlated Aristotle with the Bible. He showed that they were not necessarily opposed to each other, and worked out the philosophic synthesis which is still basic in the thinking of the Roman Catholic Church. From this time on, Aristotle's writings had almost equal authority with the Bible. When people spoke—always reverently—of The Philosopher, they meant Aristotle.

One can say then, that in the Middle Ages scientific thought, like all other thought, was nothing but an appeal to Authority—either to the Bible or to the writings of some venerated sage. It was not necessary to find out anything for oneself. All that was required was to look it up in a book.

If Pliny said that it was the crocodile's upper jaw rather than its lower one which was hinged, what need to look at a crocodile skull? It was true. If, as a result of repeated copying of an old herbal, the strawberry plant was depicted with five leaves instead of three, then strawberry leaves come in fives. If Pliny and Ovid and Vergil said that bees developed in the rotting carcasses of oxen, it was so. In consequence of this attitude, the Middle Ages was essentially a sterile period for science.

The modern scientific point of view began in the Renaissance, when men

threw off the blindfold of authority, and began to look for themselves. The roster of names is too long to give here. Galileo, Vesalius, Servetus, Fallopius and Harvey were a few of them. These men asked questions, and took no one's word for the answers. They ignored the books, and went directly to nature. Their discoveries caused the revolution.

I have described three blind alleys in man's search for an explanation of the cosmos. The first, the animistic, led to a blank wall because its practitioners had too little information to go on.

The second, the Greek, was a false path because its practitioners used only observation, deduction and intuition. They were acute thinkers, but they were not willing to test their conclusions by experiment.

The third, the medieval, went astray because its practitioners refused even to think.

At present we are treading a fourth path. Our faith is in the scientific method. We think it will lead us to our goal, for it has already given us considerable control of our physical environment. We are sure it is not a blind alley. But the primitive tribesmen, the Babylonian and Egyptian priests, the Greek philosophers and the medieval scholastics didn't think they were in blind alleys, either. I wonder what the decision of posterity will be.

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Science and Truth

Can insistence on a scientific attitude gradually help substitute facts for fancies; principles for prejudices; education for propaganda; intellectual integrity for mental cleverness; statesmanship for partisan politics; broad humanitarianism for tribalism; the Golden Rule for the law of the jungle? Can science help human beings act the part? Can it contribute to wisdom and to ethical conduct? This should be the ultimate goal.

What does science need if it is to render its maximum service in human affairs; what are the motives: personal ambition, curiosity, social service? Was

Mencken right when he wrote, "The prototype of the scientist is not the Good Samaritan but a dog sniffing tremendously at an infinite series of rat-holes"? Was Huxley right when he said, "Nothing great in science has ever been done by men, whatever their powers, in whom the divine afflatus of the truth-seeker was wanting"?

Science does or should dedicate itself to the discovery and humanization of truth. There naturally is and must be a division of labor discovery, dissemination, application. But there must be coordination also. E. C. Stakman, in *Science*.



Waste of Talents

Are top-grade high-school juniors ready to step right into college? That is a question which will get serious study during the next two years at the University of Louisville. A grant from the Ford Foundation will pay full tuition for 30 students in each of these years, picked from the top ten per cent of high-school junior classes here and elsewhere. The immediate effect will be to give 60 gifted young men a chance, without expense, to complete two years of college before they become eligible for military service. The longer-range result might be a melting of the hard line of division between high school

and college.

Many educators believe that our present system wastes the talents of our ablest high-school students, who get bored with the plodding pace of classroom work. The highly intelligent pupil might find stimulation and a challenge to his mind in the jump from high-school junior to college freshmen year.

This Ford Foundation experiment is being tried in eight American universities, including Yale, Columbia, Wisconsin and Chicago.—*Louisville Courier Journal*.

A BIOLOGIST VIEWS SOCIAL PHENOMENA

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Man in his search for peace and happiness and in his quest after truth has followed several major routes. In philosophy he has attained wisdom, in science he has gained knowledge, through observation and sound deduction. In religion he has sought after God; it has given him faith and hope. In sociology he has tried to understand the varied and kaleidoscopic changes in the human organism; individually and collectively. It is frequently said if only scientists would study society they might achieve miracles of the order of atomic fission.

Biology is the study of life in all its forms, diversities, reactions, responses, and adaptations. Biologists cannot define life; *it is cosmic* in its comprehension. A living organism is what it is because of heredity, environment and response. We inherit capacities to react and respond to both internal and external causal factors. Environment has been of great importance in molding and shaping organisms. It has been the great selector as to what organisms or species shall survive. Human individuals as well as all organisms differ in heredity and in their capacities to adjust themselves to a changing environment. In human behavior the indefinite range of individual modifiability in patterns of response emphasizes the major differences between simple organisms and complex animals. Behavior evoked by a specific stimulus can be predicted in simple organisms because of the sharp limitation of the range of possible responses. In the higher vertebrates, however, indefinite possibilities of modification in patterns of response forbid a mechanistic prediction. The best that can be done is a prediction of probabilities based on study and observation of well-established habits in the individual subject. Even then forecasts are precarious be-

cause at any moment the subject may get a new idea or change of mind.

One of the great attributes of life is the power of adjustment or adaptation. Wonderful stories of adaptations are told in the literature of biology. The older naturalists were adaptation worshipers. Success, or survival value depends upon being successfully adapted to the immediate needs of the organism and of the species. Fossil animals are in the rocks largely because they failed in their ability to change, to adapt themselves to a changing physical world.

Biologists have been studying cells for more than a century. They are the units of structure and function in the organic world. The organic world is made up of two great cellular divisions—the unicellular and the multicellular forms, both plants and animals. There is no absolute division of the two when measured in terms of interdependence. Strictly, unicellular forms are free and independent, a sort of Robinson Crusoe; they are isolationists, they have existed for eons of time, their development and differentiation have remained primitive and simple. A complex organism is made of millions of cells, a cosmic multicellular body, with all parts subordinate to the whole, all parts interdependent. Occasionally some cells lose their power of integration, they carry on this sinister work by themselves and spread among the normal cells and eventually destroy them. These cancer cells are pernicious in the society of cells.

Biologists have studied all kinds of parasitic life, the effect of the parasite on the host, and the effects of the parasitic life on the parasite. There is, finally, great harm to the host and the parasite undergoes degenerative specialization. Parasitic plants never come to bloom, they remain a sordid lot

among their green and colorful relatives.

Interesting and factual studies have been made of community life among animals, especially the insects. Man's community and social organization has placed him at the head of the complex biological world. His brain, his skilled hand and the development of social life have made him great. He could not have accomplished as much as a solitary individual. Emerson, a contemporary biologist, has again advanced the doctrine of mutual aid as more important in survival than struggle for existence. Man has evolved from a gregarious form into one with a complex and changing social order. From day to day the fleeting make-up within a community shifts and regroups. Inventions provoke irreversible alterations in social constitution and economic behavior. At any moment no community or group exactly resembles any other community or group. Every human community or social situation is unique, its parts are complexly interdependent.

Men do not desire a freedom like a protozoan or a solitary wasp but the freedom where each individual is free to serve as best he can the entire colony or community. This is what Maeterlinck calls the *spirit of the hive*. A multicellular organism is a closely-knit community, the component members of which—nervous, endocrine, circulatory, excretory, digestive, etc.,—cooperate in maintaining a dynamically steady state in the face of fluctuating external conditions.

There are many categories into which animals can be grouped with respect to their "physiological processes" and reactions, from completely automatic social behavior in some insects to the relatively unpredictable social behavior of higher birds, mammals, and man. The differences between these categories is one of degree, that is, *quantitative* rather than *qualitative*. Man, for example, has the same physiological functions and emotional drives as other mammals although his cerebral activities, his mental powers, function on a much higher level.

These differences in the level of men-

tal activity and in predictability have very important implications. Human behavior is relatively *indeterminate* and *unpredictable*, which makes him the despair of the social scientist. On the other hand, the relative unpredictability of human social behavior offers the sociologist an opportunity to mold human behavior and even to mold destinies which is not given to scientists in general.

We have come to accept the idea that the social structure is more complex than the biological; but I sometimes wonder if the reverse is not the case. The cell population of a single human brain is many times the total human population of the world. These cells are (directly or indirectly) reciprocal in their relation to a far greater degree than are men in their social interdependence. It has been estimated that the permutations of their connections are greater than the total of particles in the known universe. Each cell has its individual role, partly irreplaceable, in the whole, its own quantitative and frequently qualitative, irritability pattern, its bizarre structure as a variable unit in one of hundreds of distinctive groups. In number and in combinations of pattern, the relationships in the brain are far more complex than in a social group. There is a vast range between a *micrococcus* and the *mammalian brain*, a range perhaps greater than from a salt crystal to a microbe. Who would try to tell a biologist that his studies are extra scientific? So with the sociologist. Are sociological problems outside of the realm of scientific formulation? Some would have it that the causative factors in sociologic phenomena are too numerous and complex for scientific formulation. Others, would say social phenomena are so individualized and variable that it is impossible to classify them with significance. In social problems there should be an appeal to natural science. Problems of human affairs are by no means unrelated to the kind of universe in which we dwell and with which science is so much concerned. The difficulty is that science is either preoccupied with isolated phenomena in Nature or with the gadgets of technology. The direction of human affairs, sadly, lacks the approach of scientific inquiry.

We must all get out of the groove in our thinking in terms of our own special disciplines, in terms of one science or the other in solving human problems. We must keep in mind that we are more important than our environments.

The biologists and the sociologists are faced with a complete array of problems that grow out of cell populations, the inter-relationship of organisms and the massing of human population. A mass of organisms, a culture of protozoa, a group of human beings, bound together by some real or fancied community need, acts differently at times than each of the individual components. People divide themselves into all sorts of groups for all sorts of reasons. So divided they are likely to forget the common bonds of interrelationship. One of the most important contributions that biology can make to sociology is an emphasis on our common human heritage, the oneness of human life, all belonging to the same species. All life is basically similar in its physiological processes "A sacred kinship, which I would not forego, binds me to all that breathes." This embraces the broad evolutionary concept of all life. Can social science discern its trends and consider their validity in guidance of man's future social evolution from a study of biological evolution? At first thought one may think that man's past is very remote from the practical problems of the present civilization. Our social trends need to be studied from some broad biological view which tries to determine results in terms of a generation or century hence. Social courses that change abruptly to the right or to the left repeatedly, under the leadership of fanatical *Social Healers*, cannot lead us to a happy and more satisfying destination. Social evolution, like biological evolution, must be considered in terms of a steady state, must be studied in retrospect and in prospect. Humanity is part of all nature and an outgrowth of her handiwork. Biological evolution has followed persistent trends with a *purposeful* end in view. Biological evolution has followed definite patterns, steady and, within limits, predictable.

Human social activities follow pat-

terns already current and learned individually. Associative memory involves the recall and mental rehearsal of the past experiences. Relatively few individuals devise completely new ways of thinking or acting. The behavior of parents and associates provides models that the offspring copy consciously or unconsciously. Innovations are largely rearrangements and new combinations of behavior already current. It is reasonable to think that it is impossible for an individual, at once, to change all of his habitual behavior to entirely new patterns. Some of his habits will change. The majority will follow a predictable pattern, will recur in subsequent behavior. This is what Cannon calls physiological homeostasis or let us call it homostatic behavior. What is true of the individual is largely true of the masses unless they revert to the instinctive behavior of the herd. The development of science and technology, however good in themselves, are upsetting our social-evolutionary equilibrium. There is a great need in social homeostasis, a need to bring together the natural sciences, the social sciences, religion and moral values. All of these together will make for a social wisdom that is badly needed today. It is suggested that great scientists, together with leaders in sociology, attempt to define and predict in a scientific way and in simple language the ideals and the evolutionary trends of man and suggest a strategy for avoiding the perils, and vicious circles and to formulate a program for the attainment of lasting ideals. A few years ago, the United States Senate passed a bill to establish a National Science Foundation, excluding the section designed to make provisions of the bill applicable also to social sciences. The discussions of the matter in committee hearings and on the floor of the Senate give us some indication of the attitudes of legislators toward the social sciences and their inability to understand the inter-relationship of all the sciences, natural as well as social. Social stability as a goal for man becomes increasingly difficult in view of this situation. Research must reveal feasible methods for reconciling stability and innovations. The democratic ideal which favors discovery of ways by which differ-

ent kinds of people may live together without seeking to destroy each other might be solved by a more inclusive body in a National Science Foundation.

Our future course needs the guidance of great men, having bigger hearts, and weaker mouse traps and a possession of a great deal more of social wisdom than, apparently, is lacking in the direction of our human destiny.

The greatest problem which confronts all types of government is the problem of social cooperation. It was the failure of cooperation which led to the down-fall of almost every great civilization of the past. It is this very danger that confronts the modern world. With the increasing size of social units, cooperation among these units tends to grow weaker. Efficient cooperation may for a time be forced upon a people by a powerful *autocracy*, but history has generally shown that such a course ends in class antagonism and destruction of social union. Self-government and the majority-rule are generally recognized as the best form of government for intelligent people. A paternalistic form of government may be better for the ignorant and undeveloped races. A genuine democracy seeks and obtains a degree of cooperation which compulsion can never obtain.

False ideals of democratic liberty and equality have done and are still doing vast harm in the world. It is the duty of all who love democracy to resist these false ideals and to promote those which are consistent with social progress. Real democratic freedom is not the freedom of isolation, or of anarchy; the liberty for which the peoples of the world are fighting and dying for is not the liberty of a *Robinson Crusoe* nor *lawlessness* of *anarchy* and *revolution*. It is not the freedom to plunder or oppress or dominate others, but the freedom of fellowship, common service and mutual esteem; not freedom from social control, *but*, freedom from the tyranny or selfish individuals and classes. Normal individuals do not desire a kind of freedom like that of the cancer cells which run riot without regard to the welfare of the organism. But rather a freedom like that of normal cells of the body, each of which is

a unit preserving its own individuality and to a certain extent its own independence and free to do the work for which it is fitted under the control of the body as a whole.

Men do not desire a freedom like that of protozoa or a *solitary* wasp, which lives and works alone but rather a freedom like the ants or bees in a colony where each individual is free to serve as best it can under the control of the colony as a whole.

The so-called kings-queens-soldiers and workers are in no sense rulers or subjects or favored classes. Each does what seems good in his sight—namely the work which it is fitted by nature to do and there is no ruler but instinctive each shares in common prosperity and hardships and is esteemed according to the capacity to serve the common good. Democracy can offer, and normal human beings desire, no other freedom for the individual than *this*,—based however on *reason* and *ethics* rather than upon *instincts*.

But there is a vastly larger and more important freedom which democracy brings to society as a whole. The freedom of the individual man is to that of society as the freedom of a single cell is to that of the human being. It is this larger freedom of society rather than the freedom of the individual which democracy offers to the *world-free societies-free nations rather than absolutely free individuals*. In all organisms, in all social organizations the freedom of the minor units must be limited in order that the larger unit may achieve a new and greater freedom. In social evolution the freedom of individuals must be merged more and more into the larger freedom of society—*rac*es—*n*ations. This is the biological ideal of freedom and it should also be the democratic ideal. It is not the idea of freedom expressed in a recent song—“*Don't fence me in.*”

The supreme question which confronts our generation today—the question to which all others are merely corollaries—is whether our technology can be brought under control. Is man to be the master of the destructive forces and energies that he has created or is he to be their victim? Will this physical power which he possesses and

these new forces which are now within his grasp be employed to serve the race in constructive ways or will they be a *Frankenstein monster* that will slay its own maker? Has man the wisdom—the spiritual power—the ethical and social control over the forces he himself has let loose?

These problems of our life cannot be looked upon with complacency—*left for time to solve*. We cannot count upon *geological ages* for the development of methods of social control. What we do in this generation and the next may well decide the kind of civilization, if any, which is to dominate the globe for centuries to come. We have it within our power to tear the world to pieces whenever passions and our emotions call the tune or we can build constructively a better world in which all nations will live in peace.

Nobody can be sure of the formula by which these ends can be achieved. All that we know is that it will take knowledge-wisdom-understanding, beyond what seems available at the present

time. We must draw upon all our resources—spiritual—educational—the contributions of the social sciences—the fellowship of scholars—the common hopes of all peoples in all countries. We must cast out intolerance—devise new plans for cooperative action—even when they run counter to our traditions and techniques which we have long cherished. We need the adaptability and the buoyant faith of the pioneers if we are to meet the challenges of the new world order.

Knowledge alone is not enough to sustain man in a confused world. It was not enough in the hey-day of Greek culture; it was not enough during Rome's imperial greatness; it was not enough when the whole of the Western World was enveloped by the worst wars of which man has record. Knowledge alone is not enough today. This world stands in dire need of a faith which knowledge alone cannot give and a hope which science cannot provide. Life is more than Schopenhauer's "will to live" and Nietzsche's "will to power."



An Industrial University

Drexel Institute of Technology observed its 60th anniversary at a convocation held in Philadelphia, October 30 through November 1. General George C. Marshall, M. Georges Bidault, the French Vice Premier and Minister of Defense, and many other speakers of local and national importance addressed the convocation.

It is plain that the Selective Service will have to modify its position regarding the necessity of deferring scientists and engineers. It is a mistake to conclude that the scientific and engineering societies want a blanket deferment of professional men. They urge merely that key scientists in industry, Government and the universities remain at their posts, that the training and experience of scientists and engineers who will join the armed

Approximately 200 outstanding leaders of business and industry took part in panel discussions during the convocation. Drexel, known as Philadelphia's "industrial university," operates a co-operative education program under which its students alternately attend classes for three months and then work in industry and business for three months.



forces be exploited to the full; and that outstanding science students be deferred by a quota system and allowed to complete their courses. This last point the Selective Service seems now disposed to heed. But much more is required. A Soviet army of 12,000,000 men may not be able to muster nearly the number of scientists and engineers that it ought to have, yet it points up the deficiencies of the Selective Service's policy.—*New York Times*.

CONSERVATION—AN APPLICATION OF ECOLOGY

By RALPH W. DEXTER

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Today we are more conservation conscious than ever before. World War II forced upon us the absolute necessity of conserving natural resources. Many foresighted people have been concerned about these matters for a long time, and many others have been at least sympathetic toward conservation measures. Now, conservation has become a vital part of everyday living for every person. The common living materials—foods of many kinds, clothing and shoes, lumber, steel, copper, rubber tires, etc. are becoming increasingly difficult and expensive to secure. In time of war most of these commodities are rationed; some are unobtainable except for direct defense needs. Items which we take for granted, often use carelessly, or even waste, suddenly become scarce in times of emergency. In some communities even the water supply has reached a dangerous level. If through no other means, the world situation of recent years has driven home to millions of Americans the necessity of world-wide conservation practices and the need of individual cooperation.

Now, just what constitutes "conservation?" Havemeyer has defined the goal of conservation to be "the greatest good for the greatest number." Shelford states that the aim is to "foster and promote while utilizing." These statements are significant in that they emphasize the use of natural resources. Contrary to popular opinion, conservation does not mean placing a padlock on resources and maintaining a rigid hands-off policy. True, there are natural areas such as the national parks, state parks, and other natural preserves which should be kept in their pristine condition without disturbance of any kind. Even the preda-

tors should be protected in such areas. With the rapid decline of natural areas it is becoming increasingly important to set aside both large and small tracts of undisturbed land and water representing all of the major biotic communities of North America. However, this is but one phase of conservation. The great mass of our resources must be and should be properly managed for human utilization for both the present and the future.

These resources are of two types—replaceable and non-replaceable. The latter, including coal, petroleum, minerals, ores, metals, etc. are mined and used. Some can be reclaimed and reused and measures can be taken to avoid waste, but to increase the available supply more must be taken out of the earth's storehouse. The replaceable resources—soils, forests, grasslands, fish, shellfish, wildlife, cultivated plants and domestic animals—can be renewed in an unending cycle by proper management of the organisms and their environment based on an understanding of the conditions of existence, the balance of nature, and the cycles of basic materials.

Not the production of the maximum quantity of a single crop, domestic or game animal, but a natural, healthy increase of desirable resources in balance with all others is the aim. This is sometimes called establishment of a "sustained yield." We know from past experiences that short-sighted programs with a single aim defeat their own purpose by neglecting the interdependence of all the resources. If the promotion of one resource exhausts or destroys another below the point of an essential level of perpetuation, its dependent resources will likewise suffer including the one being

promoted. For example, if predators are totally destroyed to save a few sheep, a resulting unchecked rodent population will destroy the rangelands so that none of the sheep can survive. It is here that the science of ecology makes its greatest contribution to the art of conservation. Ecology emphasizes the interrelationships, coactions and reactions as they are called,

among all the factors of the environment, living and non-living. Only when such a working method is used can continuous, permanent results be expected. Conservation of renewable resources, then, might be thought of as the proper management of natural resources for intelligent utilization through an application of the facts and principles of ecology.



Educational Institutions Are Good Arsenals

. . . The world will not be saved from despotism and slavery by young men whose only motive in fighting for democracy is a desire to perpetuate the practice of eating blueberry pie or the custom of indulging in ice cream sodas at the corner drugstore. If this is their only aim, they will fail completely. Ideas and ideals have always been far more powerful than military weapons. The best arsenal which any democracy has ever had has always been the educational institutions within it which have sought to develop within those whom they have nurtured an appreciation of certain moral principles basic to human life, as well as a respect for the right of each to discover them according to his own particular way.

Perhaps a glaring fallacy in some of our thinking today is that instead of urging individuals to take inventory of their respective talents in order that they may fully develop them, we have created a certain amount of dissatisfaction by encouraging them to believe that they may have things far beyond their grasp with little or no effort. Economically, this has sometimes meant a policy of taking from

those who have been industrious to give more to those who have not. Educationally, it has sometimes meant an attempt to extend the scope of college training so as to include almost everyone, irrespective of his ability, with the result that there has been a lowering of academic standards and an expansion into a mass-production assembly-line type of education where personalized interest in the individual's own development and growth is non-existent. As so often happens in such cases, in trying to please all we have sometimes satisfied none. In many instances some institutions have lost sight of their true purpose of preparing persons for life and have resorted to teaching them merely how to earn a living. Their graduates have become skilled craftsmen who are experts in their own particular field but see no relationship between their work and that of someone else in another field of specialization. It is not unusual to see men thus trained left standing where they are in forward-moving business organizations merely because they do not have a broad, fundamental training. Dean Raymond A. Withey, Drew University.



THE MORAL RESPONSIBILITY TO BE INTELLIGIBLE

Clinical research is predicated upon the belief that its significant results should be communicated and used by others. How miserably this is accomplished is any contemporary editor's tale of woe and any thoughtful reader's sorrow. The pseudo-prestige of long and difficult words transcends the useful scientific term and diffuses widely through our papers. Simple things are made complicated, and the complex is made incomprehensible. Chaos reigns. The so-called medical literature is stuffed to bursting with junk, written in a hopscotch style characterized by a Brownian movement of uncontrolled parts of speech which seethe in restless unintelligibility. Every day we realize that the iron curtain which disbars us from sampling in adjacent fields of science is not so much the erudition of our colleagues as the tropical jungles of verbiage and gobbledegook in which this erudition lurks, unobserved save by the initiated. Has this unfortunate situation any corrective? If some small fraction of the time and effort which goes into the techniques of research were spent on study and perfection of the simple techniques of writing and speaking clearly, paths could be made in the jungle. Those who start late must read and study good models of exposition. Learn the simple rules: write, rewrite, delete, polish. For sage advice, Allbutt's "Notes on the Composition of Scientific Papers" has lost none of its cogency, and elegantly combines precept with example. For a contemporary view Gower's "Plain Words" is equally good. With such guides our scientific writing must improve. Correct grammar, thoughtfully combined with rhetoric, might lead through grace to that elusive quality style and make a worthy medium for telling of significant work.

William B. Bean—"A TESTAMENT OF DUTY."
Jour. Lab. and Clin. Med. 39: 3-9 (1952)

EDITORIALS

Historical Jack Pot

This issue of "The Biologist" comes to you with an unusually rich complement of historical papers. Evidently, the fabled Muse of History must have felt that her noble art was getting scant attention in the pages of our periodical. For suddenly out of nowhere came five of the most interesting articles we have offered to our readers in a long time.

Dr. Harley J. Van Cleave stepped out of his customary type of article and has given us a most interesting obituary on a truly great character in biological history, one who has long been respected and known by many of us among the older members of Phi Sigma. It is good to be able to see his dynamic features again. He was a great character and we feel honored to pay him tribute in our pages.

In the article by Dr. Lester P. Coonen, Phi Sigma welcomes a new writer to its pages. Himself a member of Phi Sigma back in his University of Wisconsin Graduate School days, his contribution is an extraordinarily fine example of the type of accurate biological publicity that should be the goal of every author. Dr. Coonen,—when his arduous duties as Head of the Department of Biology at the University of Detroit permit,—is working on a new history of biological science which, if this contribution and his other articles in the *Scientific Monthly* are any indication, will be worth waiting for.

Dr. Norman D. Levine is no stranger to our pages. Years ago we recall something of his interest in our organization. That his contribution should also

be historical is just one of those curious examples of the long arm of coincidence. We are grateful that he has remembered us.

Both Drs. Ralph W. Dexter and C. D. Dieter have appeared in these pages before. Their thoughtful articles round out what we think is a fairly representative issue of our publication. Every periodical sooner or later becomes more or less stereotyped if it adheres too closely to a restricted editing formula. We are glad to recommend our contributors because they lead us along a way we ought to be going,—away from the hide-bound and the fossilized.

Late Again!

The Editor of "The Biologist" makes no apologies for the date this issue appears. It is merely typical of what has always happened in our organization. Every Meeting Year the editorial hopper overflows with material which is contributed out of interest the National Meetings create. The interim between the National Meetings represents a period of low contribution and a sort of contrapuntal doldrums, when truth serums, spinal punctures, penethol and anything else you can imagine are of no avail in prying even chapter notes and news or officer lists out of those concerned. We are neither discouraged nor dismayed. If this is the way it is going to be, so it must be.

The Council is meeting this Summer to arrange for the National Meeting, so we should have plenty to bang out to all our members in the Fall.



NEW BOOKS

This section offers brief uncritical reports on the general content of recent publications in biological and related fields. For quick location on library shelves, each notice will be preceded, wherever possible, by three groups of numbers, the first two of which will be the Dewey and the Library of Congress classified numbers respectively. The third group is the L.C. card number, for the convenience of Librarians.

ACTINOMYCETES, by S. A. WAKSMAN; Chronica Botanica Co., Waltham, Mass.; 1950, 230 pp., 39 fig., 44 tables.

QK604.W3 589.953 50-8045

The author of this interesting work is Professor of Microbiology at Rutgers University. As one of the foremost students in the field of soil science and fungi, his publications always merit attention.

ACTION OF HORMONES IN PLANTS AND INVERTEBRATES, edited by KENNETH V. THIMANN; Academic Press, Inc., 125 East 23rd St., New York 10, N. Y.; 1952, 228 pp., illus., \$5.80.

QP801.H7T4 574.194 51-14024

Consists of four papers, one by Berta Scharrer, of the University of Colorado, on hormones in insects, another by Frank A. Brown, Jr., of Northwestern University, on hormones in Crustacea, and two by Thimann himself, one on plant growth hormones and one on other plant hormones. Dr. Thimann is at Harvard.

ADVANCES IN ENZYMOLOGY, Vol. 12, by F. F. NORD; Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y.; 1951, 570 pp., illus., \$9.75.

QP601.A1A3 612.0151 41-9213

This twelfth volume contains the following papers: Oxyreduction in Chloroplasts, by Robert Hill; Mechanisms of Fixation of CO₂ by M. F. Utter and H. G. Wood; Enzyme Substrate Compounds, by Britton Chance; Specificity of Certain Peptidases, by Emil L. Small; Enzymic Hydrolysis and Acetylcholine, by D. Nachmansohn and J. B. Wilon; Starch Chemistry, by K. Meyer and G. C. Gibbons; Enzymes of Starch, by Peter Bernfeld; Biologi-

cal Methylation, by Fred Challenger; and Reaction of Borate, by C. A. Zittle.

AGNUS CASTUS, by GOSTA BRODIN; Harvard University Press, Cambridge, Mass.; 1950, 329 pp., 1 pl.

This monograph is a contribution to the Essays and Studies on English Language and Literature which is being put out by the English Institute in the University of Upsala. It synthesizes the various manuscripts of the Middle English Herbal "Agnus Castus." This latter is named for the first plant listed in the Herbal now known as Vitex Agnus Castus. Botanists, especially taxonomists with a flair for antiques, will welcome this.

AMERICAN SOCIAL INSECTS, by C. D. and M. H. MICHENER; D. Van Nostrand Co., 250 Fourth Ave., New York 3, N. Y.; 1951, 267 pp., 109 fig., many in color, \$6.00.

QL569.M5 595.79 51-12770

The Chairman of the Entomological Department at the University of Kansas and his wife have collaborated on another of those helpful as well as interesting volumes of natural history which have been so increasingly popular ever since the days of Henri Faber. The twenty-six chapters are grouped into six parts as follows: the nature of social insects, hornets and wasps, the bees, the ants, the termites, insect societies and their parasites.

AMERICAN WEASELS, by E. RAYMOND HALL; University of Kansas, Lawrence, Kansas; 1950, 466 pp., 41 pl., 31 fig.

Colored plates of weasel variants and a map to accompany each open this monograph. There follows an 86-page introduction dealing with such topics as geological traces, skeleton variation,

distribution and classification. Then the four species, *erminia*, *rixosa*, *frenata* and *africana*, are each treated more or less extensively. Thirty-nine of the plates are photographic reproductions of from six to ten skulls each offered as part of the diagnostic evidence under cranial measurements.

ANALYSIS OF THE DISTRIBUTION OF THE BIRDS OF CALIFORNIA, by ALDEN H. MILLER; University of California Press, Berkeley, Calif.; 1951, 644 pp., 8 plates, 5 fig., 13 tables, \$1.50 paper covers.

This is a monograph on the habitats of the local birds. The title unfortunately suppresses its most generally valuable asset—the correlation of bird population with the life zones and ecological formations.

AQUARIUM HIGHLIGHTS, re-edited by WILLIAM T. INNES; The Innes Publishing Co., 129-139 North 12th St., Philadelphia 7, Pa.; 1951, 519 pp., illus.

QH68.A172 590.74 Agr 51-135
Those fish lovers who have missed the earlier volumes of "The Aquarium" may here recoup part of their lost chances, since this is a reprint of the best articles, letters, illustrations (and cartoons) that have appeared since 1932. The author's unique position as one of the deans of cultivated piscatology in the United States makes this a valuable as well as interesting work on exotic aquarium fish.

BEGINNER'S GUIDE TO ATTRACTING BIRDS, by L. A. HAUSMAN; G. P. Putnam & Sons, 210 Madison Ave., New York, N. Y.; 1951, 127 pp., 27 pp. of illus., \$2.00.

QL676.5.H35 598.2 51-13106
People who like to have birds around their homes or campuses will want to have this unexpectedly unusual little pocket-sized book. It is a worthy addition to the Putnam series of Nature Field Books.

THE BIBLE AND MODERN SCIENCE, by HENRY M. MORRIS; The Moody Press, 153 Institute Place, Chicago 10, Ill.; 1951, 191 pp.

BS650.M56 215 51-14999

This book is a public profession of the faith of the author, a member of Phi Beta Kappa, Sigma Xi and Tau Beta Pi, and presently Professor of Civil Engineering at Southwestern Louisiana Institute, Lafayette, La. He is an active churchman and public speaker. His book will be liked and appreciated by those whose reconciliation of scientific fact with strict biblical interpretation requires complete suppression of the former where it appears to contradict the latter. The book is neither scientific nor critical. The documentation is evangelical and fundamentalistic.

BIOLOGY, THE STORY OF LIFE, by ERNEST S. BOOTH; Pacific Publishing Assn., Mountain View, Calif.; 1950, 710 pp., illus.

QH47.B6 574 50-12899

Here is a new high school textbook in its first edition designed for the student who believes in the Bible. It was prepared at the request of and under the direction of the Department of Education of the Seventh Day Adventists. It is exceptionally well illustrated, well referenced, and affords a very interesting example of motivated biology.

BIOLUMINESCENCE, by E. NEWTON HARVEY; Academic Press, Inc., 125 East 23rd St., New York 10, N. Y.; 1952, 649 pp., 185 fig., \$12.00.

QH641.H27 574.144 52-6754

Dr. Harvey is perhaps the world's leading authority on this subject. In this work he sums up all that has been discovered on the subject, treating the life forms from bacteria, fungi, protozoa, up through the animal phyla to include the fish. A 75-page bibliography just about exhausts the available papers or references of any importance on the subject.

BIOMETRIC ANALYSIS, by ALAN E. TRELOAR; Burgess Publishing Co., 426 South 6th St., Minneapolis 15, Minn.; 1951, 251 pp., \$4.50.

HA29.T68 311.2 51-2631

Any manual on as abstract a phase of biology as analysis, which can start off with as illuminating a wise-crack as this one does, deserves attention. The fundamental techniques of analysis are here treated realistically.

Other sciences than biometry can and do use the same technical approach.

THE BIRD, by GERTRUDE HESS; Greenberg Publishers, 201 East 57th St., New York 22, N. Y.; 1951, 244 pp., 188 fig., \$4.00.

QL673.H483 598.2 51-8724

Recently translated from the German, this book attempts to fill a gap in our plethora of books-about-birds which do not seem to have time to give the general ornithological facts and principles. The chapters deal successively with migration, reproduction, body structure and function, and bird ancestry.

BIRD GUIDE, by CHESTER A. REED; Doubleday & Co., Inc., 575 Madison Ave., New York 22, N. Y.; 1951, 238 pp., 300 illus. in color, \$1.95.

QL683.R35 598.2973 51-388

If you draw an NS line through the middle of the states in the second tier west of the Mississippi, you will have delineated the western boundary of the birds described in this handy pocket volume. So much praise has already been heaped upon Doubleday and Company for the pocket guide series to which this is a good addition, there would seem no further use or pain in gilding the lily.

BIRDS ARE YOURS, by ROBERT S. LEMMON, and DON ECKELBERRY; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1951, 121 pp., \$2.25.

QL676.L45 598.2 51-14819

A pocket-sized little volume of true to nature stories about bird behavior and habits.

BOTANICAL MICROTECHNIQUE, by JOHN E. SASS; Iowa State College Press, Ames, Iowa; 1951, 228 pp., illus., \$3.50.

QK673.S3 578.8 51-13889

This is the second edition of a good work on plant histological techniques. Many fixation and mounting techniques are discussed in the first eleven chapters. There are four chapters on special methods, one on the microscope and one on photomicrography.

BOTANY, A LABORATORY MANUAL, by T. E. WEIER, C. R. STOCKING and

J. M. TUCKER; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1951, 140 pp., illus., \$2.25 paper covers.

This is the lab manual to accompany the Weier textbook announced elsewhere in this section. It runs strong to structure but not particularly generous in function. This should make it of interest to the taxonomically inclined. With it: (SUGGESTIONS FOR LABORATORY INSTRUCTORS, by the same authors and publishers, 1952, 26 pp., is free to teachers using the lab manual, "off limits" to anyone else.)

CALIFORNIA VELVET ANTS OF THE GENUS DASYMUTILLA ASHMEAD, by PAUL D. HURD, JR.; University of California Press, Berkeley, Calif.; 1951, 19 pp., 1 plate, 1 fig., 35¢ paper covers.

A51-9843

Middle states and eastern biologists would be interested in these whiskery-abdomened ants which are the subject of this taxonomic paper.

THE CHEMISTRY AND ACTION OF INSECTICIDES, by HAROLD H. SHEPARD; The McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y.; 1951, 504 pp., 111 tables, 22 fig.

SB951.S5 632.951 51-3427

The former Assistant Professor of Entomology at the University of Minnesota, later Associate Professor of Insect Toxicology at Cornell, and now with the insecticide division of the U.S.D.A., here presents us with a manual covering the general facts and theories relating to the chemical, physical and toxicological as well as historical and commercial aspects of insect disposal. The fourteen chapters run the whole gamut of the field from arsenicals to attractants and repellants.

COLLEGE BIOLOGY, by W. H. WELHOUSE & G. O. HENDRICKSON; Iowa State College Press, Ames, Iowa; 1951, 371 pp., illus., \$4.00.

QH308.W42 574 51-13896

This fourth edition is completely and thoroughly revised, with added illustrations. The text is intended for

junior college or general college students who haven't time for extended laboratory or intense library exercises.

THE COMING OF THE FLOWERS, by A. W. ANDERSON; Farrar, Straus & Young, Inc., 53 East 34th St., New York 16, N. Y.; 1952, 267 pp., \$3.00.

The Curator of the Botanical Gardens in Timaru, New Zealand, is evidently a most well-informed literary, historical and botanical type of gentleman. In the 54 chapters of this medium-sized volume, he discusses interestingly on all sorts of common flowering plants and how they got into our gardens from the far-off places of their origin or survival. This book is a "must" in the botanical library.

COMPARATIVE ANATOMY OF VERTEBRATES, by T. H. EATON; Harper & Brothers, 49 East 33rd St., New York 16, N. Y.; 1951, 340 pp., 332 fig., \$4.00.

QL805.E28 591.4 51-11382

This is a concise, well-illustrated, informally written one-semester textbook, which emphasizes relationships between vertebrate groups as shown by structural and functional evolution.

THE CONQUEST OF EPIDEMIC DISEASE, by CHARLES-EDWARD A. WINSLOW; Princeton University Press, Princeton, N. J.; 1944, 411 pp., \$4.50.
RA651.W5 614.49 A43-2734

Although published back in 1944, this copy of the author's "chapter in the history of ideas" has only now shown up on the editorial desk. For all of which this reviewer is grateful. In 1944 he was in practical contact with epidemic (malaria and dengue) diseases in the Southwest Pacific. That the book is just as fresh now as it was when first published will strike the attention of every reader. The author's broad readings in a list of references that takes thirteen pages to cover reflect themselves in a temperate history of epidemiology that fills a definite place on our shelves.

DECIDUOUS ORCHARDS, by W. H. CHANDLER; Lea & Febiger, Washington Square, Philadelphia 6, Pa.; 1951, 436 pp., 113 fig., \$6.50.
SB355.C68 634 Agr. 51-19

This second edition of Chandler's standard work has undergone thorough revision. The book is quadripartite. Its first is devoted to the tree and its flowers and fruits, the second to deciduous orchard environments, the third to growing and training deciduous orchard trees, and the fourth and largest to deciduous orchard species.

THE DESIGN AND ANALYSIS OF EXPERIMENTS, by OSCAR KEMPTHORNE; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 631 pp., \$8.50.

HA29.K425 311.2 51-13460

The Professor of Statistics at Iowa State College who authors this imposing volume began his life work as Assistant Statistician at Rothamsted Experiment Station in England. His book is for the experimenter, the consulting statistician and the mathematical statistician. It is definitely Greek to the biologist who is mathematically innocent. To the mathematically awake biologist, it is a beautiful piece of work.

DETERMINATIVE BACTERIOLOGY, by THOMAS H. LORD; Burgess Pub. Co., 426 South 6th St., Minneapolis 15, Minn.; 1952, 63 pp., \$2.25 paper covers.

Sixty-three pages of text, consisting of 28 exercises and 15 pages of formulae, make up this manual for running down unknown bacterial organisms. There are 25 blank determination sheets in the back of the book, which is spirally bound. They should, therefore, be easily detachable.

DICTIONARY OF BIOLOGY, by M. ABERCROMBIE, C. J. HICKMAN and M. L. JOHNSON; Penguin Books, Inc., 3300 Clipper Mill Road, Baltimore 11, Md.; 1951, 246 pp., 10 fig. 50¢.
QH13.A25 574.03 51-8973

Two zoologists and a botanist representing Oxford and Birmingham Universities collaborated in producing this pocket-sized but big book content addition (R3) to the really impressive Penguin series. So much trash is appearing in pocket-sized books that it is refreshing to see such worthwhile contestants staying in the ring.

DISEASES IN PLANTS, by NEIL E. & RUSSELL B. STEVENS; *The Chronica Botanica Co.*, Waltham, Mass.; 1952, 215 pp., 61 fig. \$4.75.

This book may fill your needs if you are looking for an introductory text-book which is concerned chiefly with the phenomena of disease in plants and only accidentally with individual diseases.

DISEASES OF BUDGERIGARS, by CESSA FEYERABEND; *All Pets Magazine*, Fond du Lac, Wis.; 1951, 96 pp. SF995.F44 636.686 Agr 51-532

Written for the American fancier of the shell parakeet,—often incorrectly called the “love bird,”—this practical little book seems to cover almost every phase of the subject. Now that the importation of parrot family birds is said to be again possible due to a better knowledge of the causes of virus pneumonia, the keeping of “budgies” and other members of its tribe may well become a popular pastime.

DISEASES OF THE TROPICS, by G. C. SHATTUCK; *Appleton-Century-Crofts, Inc.*, 35 West 32nd St., New York 1, N. Y.; 1951, 803 pp., 131 fig. RC961.S44 616 51-903

Here is a new book, written because of the greater inroads the tropics have been making on our complacency ever since the war (“Big 2”) and the advent of the airplane. It begins with the protozoa of the blood and tissues, goes on to spirochaetoses, then treats the rickettsial diseases, the bacterial, the viral, and the helminthic diseases. Lastly, there are sections devoted to intestinal protozoa, the mycoses, nutritional disorders, tropical climates and health, and various noxious animals and plants.

DISTRIBUTION AND POPULATIONS OF SUMMER BIRDS IN SOUTHWESTERN GEORGIA, by ROBERT A. NORRIS; *University of Georgia Press*, Athens, Ga.; 1951, 67 pp., 15 fig., 6 tables, \$1.25 paper covers. QL684.G4N6 598.29758 51-14348

A slim, paperbound, monograph dealing with the mid-June to late August bird inhabitants in an 8-county area lying between the Flint and the Chattahoochee Rivers in the southwestern

part of Georgia. The Emory University Field Station was used as a base of operations.

ECOLOGY AND DISTRIBUTION OF HEPATICAE IN CENTRAL AND WESTERN NEW YORK, by R. M. SCHUSTER; *University of Notre Dame Press*, Notre Dame, Ind.; 1950, 201 pp., 18 plates. QK556.S35 588.3 50-2335

This is a reprint of the original 1949 paper on the liverworts which first appeared in the *American Midland Naturalist*. It includes an historical and taxonomic section as well as an extensive series of ecological and phytogeographic observations.

ECOLOGY OF ANIMAL PARASITES, by JEAN G. BAER; *The University of Illinois Press*, Urbana, Ill.; 1951, 224 pp., 162 fig., \$5.00. QL757.B28 591.69 51-9761

This is a thin 8½ by 11-inch cloth-bound text which divides the subject matter in a fivefold pattern. First there is a discussion of animal associations and definitions. The next part takes up adaptations and parasitism from the protozoa up to the cestodes. The third section treats of host-parasite relationships, while the fourth is devoted to the physiology of parasites, which, incidentally, includes a chapter on in-vitro cultures of parasitic helminths. There is a fifth and final chapter devoted to the origin of parasitism.

ECONOMIC BOTANY, by ALBERT F. HILL; *The McGraw-Hill Book Co., Inc.* 330 West 42nd St., New York 36, N. Y.; 1952, 560 pp., 250 fig., \$7.00. SB107.H65 581.6 51-12617

This second edition has been revised to bring its offerings more thoroughly into line with the results of the war impact on American acquaintance with economic plants around the world. As food, sources of strategic materials, or medicinal and drug supplies, the number of plants of real economic importance has increased by leaps and bounds. To meet this challenge has been the aim of the author.

EMBRYOS AND ANCESTORS, by G. R. DE BEEER; *Oxford University Press*, 114 Fifth Ave., New York 11, N. Y.;

1951, 159 pp., 18 fig., \$3.00.

QH371.D4 575 40-34719

This is the second and revised up-to-date edition of a work which first appeared in 1940. The author who is Director of the British Museum, holds no brief for the theory of recapitulation. His thesis is that a synthesis of embryonic development and evolutionary descent will open up new fields of observation and coordination of studies in embryology, genetics and evolution.

ENZYMES AND ENZYME SYSTEMS, edited by JOHN T. EDSELL; Harvard University Press, Cambridge 38, Mass.; 1951, 146 pp., \$3.00.

QP601.E2 621.0151 51-10717

Subtitled "Their State in Nature," this little work is a composite of papers, the first in a series to be known as "The Memoirs of the University Laboratory of Physical Chemistry Related to Medicine and Public Health of Harvard University." They are an outgrowth of a symposium on "The State in Nature of Proteins and Protein Enzymes." A lot of newer research in protein histology, biochemistry and physiology is compacted into these six lectures.

EXPERIMENTS IN BIOCHEMISTRY, by MAX S. DUNN and WILLIAM DRELL; The McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y.; 1951, 254 pp.

QH324.D8 612.015072 51-8591

Forty-six experiments are presented in the first 115 pages. The next 38 are taken up with supplies, special experimental directions or warnings including first aid reagents. There is a 25-page bibliography. The index (14 pages long) precedes a collection of data sheets for each experiment.

FARMING AND GARDENING IN THE BIBLE, by ALASTAIR MACKAY; Dodale Press, Emmaus, Pa.; 1950, 280 pp., \$3.00.

BS665.M2 220.863 51-9556

A retired commander of the Royal Canadian Navy has presented here a nondenominational, noncontroversial, coordinated treatment of all the agricultural and horticultural references in Holy Writ. Whenever the author allows the Bible to speak for itself, he

clings to the familiar beloved authorized version. It makes a good and an interesting book. There is a good index to bible references and a very complete subject index which is quite a concordance in itself.

FERNS OF GEORGIA, by ROGERS McVAUGH & JOSEPH H. PYRON; University of Georgia Press, Athens, Ga.; 1951, 195 pp., illus., \$5.00.

QK525.5.G4M3 587 52-882

A well illustrated manual with maps indicating the areas where each species is found. The authors have covered the state in their work, traveling over six thousand miles in doing so. The senior author is Professor of Botany and Curator of Phanerogams at the University of Michigan. The junior author was formerly Instructor in Botany at the University of Georgia, but is now in the air force.

FIELD CROP INSECTS, by F. A. FENTON; The MacMillan Co., 60 Fifth Ave., New York 11, N. Y.; 1952, 405 pp., 224 fig., \$5.75.

In this new book, the Professor of Entomology at Oklahoma A & M College makes his bow to the textbook and classroom audience. His aim in this work is to present first basic principles, as well as their application to the more practical problems of control.

FLORA OF THE CHARLESTON MOUNTAINS, CLARK COUNTY, NEVADA, by IRA W. CLOKEY; University of California Press, Berkeley 4, Calif.; 1951, 274 pp., 1 map, \$3.75.

A51-9609

This report covers much of the Nevada National Forest area. The late author was a mining engineer by profession but a botanist at heart. He wisely chose this out-of-the-way corner to do his botanizing because he realized that it was least likely to attract the scientific attention from other botanists. As plant geography develops, such papers as this will become increasingly important.

FOREST ANIMALS AND HOW TO DRAW THEM, by AMY HAGEBOOM; The Vanguard Press, Inc., 424 Madison Ave., New York 17, N. Y.; 1950, 39 pp., illus., \$1.75.

NC780.F623 743.6 51-9311

Number eight in the "How to Draw" series deals with the fawn, beaver, rabbit, fox, weasel, skunk, squirrel, opossum and elk. All of which should afford sick-a-bed or rainy day entertainment and subconscious training for budding biologists.

FOREST ENTOMOLOGY, by SAMUEL A. GRAHAM; McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y.; 1952, 351 pp., 85 fig., 12 tables, \$6.00.

This is the third edition of Dr. Graham's work, originally published in 1929 and again in 1939. It has been extensively rewritten and brings the forest insect control techniques and literature up to date. There is a 21-page bibliography which contributed mightily to the latter result.

FRENCH ENGLISH SCIENCE DICTIONARY, by LOUIS DE VRIES; The McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y.; 1951, 596 pp., \$6.50.

Q123.D37 503 51-12562

The price asked is not too much for the assistance of approximately forty thousand French scientific words in reading articles of aeronautical, agricultural biological, electronic, physical, radar, radio and even television interest. As the author or editors have very appositely quoted from redoubtable old Sam Johnson: "Dictionaries are like watches; the worst is better than none, and the best cannot be expected to go quite true." Which is to be expected in an age of scientific development as rapid as our own.

FUNCTIONAL ENDOCRINOLOGY, by N. B. TALBOT, E. H. SOBEL, J. W. MCARTHUR & J. D. CRAWFORD; Harvard University Press, Cambridge, Mass.; 1952, 638 pp., illus., \$10.00.

Definitely a practitioner's book, filled with practical information on the endocrine systems in health and disease, as well as the treatment of endocrine disturbances. There is much more applied endocrinology in this book than in most of those which students are usually given to study.

FUNDAMENTALS OF SOIL SCIENCE, by C. E. MILLAR and L. M. TURK; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1951, 510 pp., 102 fig., 58 tables, 9 charts, \$5.50.

S591.M67 631.4 Agr 51-535

This is the second edition of a text emanating from the soil science department at Michigan State College. Its purpose as a textbook, aside from its use by conservationists, agriculturists, and others interested, is to familiarize its users with various soil types and their characteristics, to set forth the relationships between soils and plants, and to circulate the fundamentals of soil use and conservation.

FUR-BEARING ANIMALS, by BRUNO WALLMEYER; W. S. Heinman, 125 East 23rd St., New York 10, N. Y.; 1951, 232 pp., 78 illus., \$14.00.

This bilingual book in German and English is designed mainly for the fur industry, but contains 78 animal illustrations, apparently charcoal sketches, done in such realistic style by Walter Reuter that they constitute what is in effect an art gallery of no mean importance and much realistic beauty.

GARDEN BOOK OF BETTER HOMES AND GARDENS, edited by F. B. WOODROFFE; Meredith Publishing Co., Des Moines, Iowa; 1951, 480 pp., illus.

SB405.B52 635.9 Agr 51-518

Clever planning went into this attractive production. Unlike other garden books, it is a loose leaf job, each of the twenty sections being divided by tab-edged fiber separators, each of which is labeled and numbered. From lot planning, lawns, continuous blooms, roses, shrubs, evergreens,—to name the first six,—it runs the gamut of garden theory and practice up to include pests and diseases, house plants, seed starting, garden reminders, and the index.

GARDENING GUIDE, edited by GUY NEFF; Meredith Publishing Co., Des Moines, Iowa; 1952, 186 pp., illus., \$1.00.

This is the Better Homes and Gardens profusely illustrated guide, conveniently divided into sections on landscaping and lawn care, plant materials,

house plants and decoration, roses, bulbs, etc., food gardening and garden operations.

GENERAL BACTERIOLOGY LABORATORY MANUAL, by L. S. MC CLUNG; W. B. Saunders Co., West Washington Square, Philadelphia, Pa.; 1952, 132 pp., \$2.50.

This second edition contains fifty-nine exercises, mostly on basic nondestructive bacteriological processes. There are six very practical appendices dealing with the use of the microscope, stains and other reagents, culture media, list of cultures used, laboratory techniques and questions on the exercises.

GENERAL BIOLOGY, by JAMES WATT MAJOR, The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1952, 875 pp., many text fig., \$6.75.

QH308.M33 574 52-788
Dr. Mavor's book is the way of becoming famous. It first appeared in 1931 and has gone through three editions and now appears in its fourth edition. Many new ideas have been introduced. They include a synoptic table of the plant and animal kingdoms, reference and background material in chemistry and a glossary.

GENERAL BIOLOGY, by PERRY D. STRAUSBAUGH & B. R. WERMER; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 813 pp., illus., \$6.00.

This third edition increases the offerings of its predecessors by an introductory chapter on the scientific method, additions to the enzymes, many new illustrations, and rewritten chapters on the origin of life, evolution and phylogeny.

GENERAL EDUCATION IN SCIENCE, by J. BERNARD COHEN and FLETCHER G. WATSON; Harvard University Press, Cambridge 38, Mass.; 1952, 217 pp., \$4.00.

Q181.W86 507 52-5026
Introduced by President Conant, this report of the General Science Workshop at Harvard in the Summer of 1950 contains papers by: Sidney J. French, Paul B. Sears, Edwin C. Kemble, Phillip Frand, J. B. Cohen, L. K.

Nash, Frederick G. Kilgour, Philippe Le Corbeiller, S. A. Goudschmidt, Edward C. Fuller, George E. Erikson, Henry S. Dyer, and Fletcher G. Watson.

GENETICS LABORATORY MANUAL, by ELDON J. GARDNER; Burgess Publishing Co., 426 South 6th St., Minneapolis 15, Minn.; 1952, 53 pp., \$1.50.

Neatly packaged, punched for a three-ring binder, this manual seems to be hitched to no particular textbook. In fact, there isn't a single reference to any standard text, nor any bibliography we have been able to discover. This should throw the student pretty much on his own resources, which may not be a bad idea, since so many modern collegians seem to be indoctrinated to lean on someone else.

GENTIAN IN THE GARDEN, by G. H. BERRY; Farrar, Straus & Young, 101 Fifth Ave., New York 3, N. Y.; 1952, 153 pp., 32 illus., 9 color plates, 4 tables, \$4.75.

This is the only recent and complete work on this subject. The author is an amateur who has made a hobby of his love for these unusual flowers.

GLOSSARY OF BOTANIC TERMS, by B. D. JACKSON; Hafner Publishing Co., 31 East 10th St., New York 3, N. Y.; 1950, 481 pp., \$4.00.

QK9.J3 580.3 50-558

This is the fourth edition of a practical dictionary of some 25,000 terms, mostly botanical, or bordering on that phase of science. Dictionaries do not sell rapidly. That this work has required four editions in fifty years speaks well for its usefulness.

GRASSES OF WISCONSIN, by NORMAN C. FASSETT; University of Wisconsin Press, 811 State St., Madison 5, Wis.; 1951, 174 pp., 356 fig., 182 maps, \$3.00.

QK495.G74F3 584.9 51-13758

If, to the delight of many botany undergraduates, all plant taxonomists were lined up and every tenth one were to be liquidated, perhaps not a single specialist in the grasses would be missing when the final roll was taken. All of which probably means that the grass

family is neither the easiest nor the most popular for professional study. There might be another reason in that most manuals of grass taxonomy leave something to be desired in their presentation of the subject. All of which is by way of saying that this new presentation of the grasses of Wisconsin has many features to commend it,—the lucid, almost crystal clear, description of the grass structure is one; the generous supply of range maps of the state is another; the two-page insertion on the geology of the state is a third; and the essay by Professor John T. Curtis on the vegetation of Wisconsin is a fourth. The 356 illustrations make a good fifth point in its favor. There is also a glossary.

GREEN FINGERS AND OTHER POEMS, by REGINALD ARKELL; Harcourt Brace & Co., 383 Madison Ave., New York 17, N. Y.; 1952, 118 pp., \$2.00.

PR6001.R5G77 821.91 52-6485
One hundred odd poems, bits of verse, rhymes and poetic bits all with a horticultural flavor are presented here. Many have an all too true bit of psychology sandwiched between the lines, as for instance:

THE LAWN

I don't mind the lawn when I mows it,
And rolling is all very well;
I sands it and I seeds it,
I waters and weeds it,
But trimming the edges is hell.

A GUIDE TO BIRD FINDING EAST OF THE MISSISSIPPI, by O. S. PETTINGILL, JR.; Oxford University Press, 114 Fifth Ave., New York 11, N. Y.; 1951, 659 pp., illus., \$5.00.

QL683.P43 598.2973 51-12259
This is a most intriguing book. Twenty-six states east of the Mississippi are here studied in alphabetical order from Alabama to Wisconsin. The general plan is to give the ornithology of the state in relation to its physiography and biological groups. Then each of the best known regions and bird communities is described and the more uncommon inhabitants listed. The book ends with several pages of suggested reference material. The table of contents lists the birds by common names and all the locations

where they may be expected. Illustrations are by George Miksch Sutton.

HANDBOOK OF PSYCHOSOMATIC MEDICINE, by ALFRED J. CANTOR; Julian Messner, Inc., 8 West Fortieth St., New York 18, N. Y.; 1951, 302 pp., \$5.00.

RC541.C3 616.34 51-14545

The author, an eminent proctologist and specialist in diseases of the intestinal tract, here introduces a theory and method of treating possibly psychogenic sources of various intestinal disorders by what is known as "Silent Level Therapy."

HARDY PLANTS, edited by F. A. MERCER and ROY HAY; The Studio Publications, 423 Fourth Ave., New York 16, N. Y.; 1952, 142 pp., 155 illus., \$5.00.

This series of ten essays on various types of hardy garden plants makes up the third volume in the Studio Gardening annual, "Gardens and Gardening." It is beautifully illustrated, full of lists of outstanding varieties under each of the types treated by leading English authorities.

HETEROCYCLIC COMPOUNDS, Vol. 3, by ROBERT C. ELDERFIELD; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 442 pp., \$12.00.

QD400.E4 547 50-7589

This third volume in Dr. Elderfield's monolithic series on the heterocyclic compounds treats of the indoles and their derivatives, followed by the indolenines, the indolines, the oxindoles, the indoxyls, the isatins, the dioxindoles, and the indigos. Outside the select group of the biochemists the physiologists, these words are just so much Greek to the average biologist, unless he remembers that the indigos were used as dyes almost from the beginning of civilization and that modern research has turned some of these substances to good account as plant auxins.

HETEROCYCLIC COMPOUNDS, Vol. 4, by ROBERT C. ELDERFIELD; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 674 pp., \$17.00.

QD400.E4 547 50-7589

This volume in the series leads off with a chapter on the chemistry of quinoline by Elderfield, followed up by one on isoquinoline by Walter J. Gensler, another on the acridines by Adrien Albert, and two concluding on phenanthridine and benzoquinolines by L. P. Wells. Biochemists will welcome this addition to the heterocyclic series. The rest of us will note the antibacterials like acriflavine, malaria depressants like atabrine, the whole range of the chinona derivatives and the latest and more powerful antimalarial quino-
crine.

HISTORICAL GEOLOGY LABORATORY MANUAL, by MARGARET W. SKILLMAN; Burgess Publishing Co., 426 South 6th St., Minneapolis 15, Minn.; 1951, 166 pp., 83 fig., \$2.50.

A new spiral-wire-bound for an elementary course in the more or less paleontological side of geology. In addition to the purely fossil side, there are sections on sedimentation and stratigraphy, map interpretation and historical geology.

HISTORY OF AMERICAN ORNITHOLOGY BEFORE AUDUBON, by ELSA G. ALLEN; American Philosophical Society, Independence Square, Philadelphia 6, Pa.; 1951, 591 pp., 55 fig., \$2.00 paper covers.

Q11.P6 598.297 51-7901
A fascinating monograph which long needed doing and which no good ornithological library can afford to be without.

HOW TO BE HAPPY THOUGH DRAFTED, by JAMES E. SELIGMANN; Sterling Publishing Co., Inc., New York 17, N. Y.; 1951, 79 pp., illus., \$1.00.

U766.S45 355.12 51-11665

This is the sort of paperbound consolation people who were in the service in "Big 2" (or Korea) like to send to their friends who have received the Presidential "Greetings" letter. The cartoons by John Fischetti are worth the price of the book alone.

HOW TO GROW AFRICAN VIOLETS, by CAROLYN K. RECTOR; the Lane

Publishing Co., Menlo Park, Calif.; 1951, 94 pp., illus., \$1.35.

SB413.A4R4 635.93383 51-2495

There are other and larger books on this popular addition to modern house plants, but this one seems to cover most of the high points in the culture of St. Paulia. It shies away from the thorny question of species, varieties and their characteristics.

HOW TO KNOW THE AMERICAN MAMMALS, by IVAN T. SANDERSON; Little Brown & Co., 34 Beacon St., Boston 6, Mass.; 1951, 164 pp., 183 illus., 25 color, \$2.50.

QL715.S15 599 51-12825

Ivan Sanderson is well enough known as a naturalist to merit attention to his handy pocket-size book. The illustrations by Louis Agassiz Fuytes, one of the nation's foremost animal illustrators, add materially to its attractiveness.

HOW WE HEAR, by MAX F. MEYER; Charles T. Branford Co., 551 Boyeston St., Boston 16, Mass.; 1950, 117 pp., \$2.50.

ML3820.M5 781.1 50-11493

Fifty years of work on acoustics and music is summarized in this little volume. Any one professionally interested will find that the author has some rather ingenious approaches to his subject. In his last chapter he lays down a theory of music which he submits as the real basis that is psychologically correct.

HUMAN BIOCHEMISTRY, by ISRAEL S. KLEINER; The C. V. Mosby Co., 3207 Washington Ave., St. Louis 3, Mo.; 1951, 695 pp., 83 fig., 51 tables, \$7.00.

QP514.K5 612.015 51-6339

Pyrogens, sulfa drugs, cortisone and ACTH, micolytic enzymes, radioactive isotopes, the antibiotics, and several other more or less recent clinical developments mark the closing pages of this definitely up-to-date medical text. Several of the large illustrations are done in color. The author is Professor of Biochemistry and Director of the Department of Biochemistry at New York Medical College.

IMMUNOLOGY, by N. P. SHERWOOD;
The C. V. Mosby Co., 3207 Wash-
ington Ave., St. Louis Mo.; 1951, 731
pp., 21 fig., 14 tables, 7 plates, \$8.00.
QR181.S5 612.11821 51-10710

This is the third edition of the 1935 original work. It is somewhat changed, including a new chapter on the Rh factors, as well as latent infection, viral infections, vertebrate veins in metastasis, and the role of vitamins and endocrines in resistance.

INSECTS, by H. S. ZIM & C. COTTAM;
Simon & Schuster, Inc., 1230 Avenue
of the Americas, Rockefeller Center,
New York 20, N. Y.; 1951, 157 pp.,
225 illus. in color, \$1.00.
QL583.255 595.70973 51-10558

Seldom does one have the chance to pick up so beautifully printed a popular insect guide so reasonably priced as this. The colors are vivid, the nomenclature is all popular,—just the sort of a handy little volume to stimulate the interest of any intelligent youngster.

INTERNATIONAL REVIEW OF CY-
TOLOGY, edited by G. H. BOURNE
and J. F. DANIELLI; Academic Press,
Inc., 125 East 23rd St., New York
10, N. Y.; 1952, 368 pp., illus., \$7.80.

Contributing authors to this new work number sixteen and range from the University of Wisconsin to the University of Utrecht in Netherlands. Seven of the authors are British, seven American, and the other three hail from Holland, Denmark and Switzerland. Their articles contribute the most recent productions in the newer phases of their subjects.

INTRODUCTION TO MYCOLOGY, by
J. A. MACDONALD; Academic Press,
Inc., 125 East 23rd St., New York
10, N. Y.; 1951, 177 pp., 163 fig., \$3.00.
K603M33 589.2 52-7700

Placing first things first seems to be this author's happy felicity. He aims to restrict his account to the major phenomena and then only in general terms, thus averting all too common student bewilderment in the face of diversity of phenomena and mass of examples therein described.

THE ISOCORTEX OF MAN, by PERCI-
VAL BAILEY & GERHARDT VON BONIN;
University of Illinois Press, Urbana,
Ill.; 1951, 301 pp., 121 fig., 15 plates,
\$5.00 paper, \$6.00 cloth.

QM455.B26 611.81 51-13538

This is the successor to the authors' previous work on the macaque and chimpanzee which was published in 1950 and reviewed in this magazine the following year (February). In this volume the authors strive for the precise homology between all three types of primates, man included. This report treats of the growth and weight of the brain, its fissures, cortical types, serial sections, the brain map, inter-cortical connections, afferent and efferent connections, and their fundamental significance.

KEY TO AMERICAN ANIMAL
SKULLS, by BRYAN P. GLASS; Bur-
gess Publishing Co., 426 South 6th
St., Minneapolis 15, Minn.; 1951, 54
pp., 105 fig., \$2.00 paper covers.

QL715.G58 599 51-14291

This spirally-bound manual treating the mammals from the Marsupialia to the Xenartha fills a want in our collecting literature. The author is a member of the Department of Zoology at Oklahoma A and M at Stillwater.

KINESEOLOGY MANUAL, by LEON G.
KRANZ; C. V. Mosby Co., 3207 Wash-
ington Ave., St. Louis, Mo.; 1951,
219 pp., illus., \$3.00 paper covers.

QP301.K66 612.74 51-13333

Physical educators will probably want this book. The author is Professor of the subject and Chairman of the Department at Northwestern University. There is a lush profuity of illustration.

LABORATORY COURSE IN BIOL-
OGY, by JAMES C. ADELL & LOUIS E.
WELTON; Ginn & Co., 72 Fifth Ave.,
New York 17, N. Y.; 1951, 282 pp.,
\$2.20 paper covers.

Fourteen units of high school biology in a punched papercovered book which should fit into a three-ring binder. There are reading lists for each unit to accompany any or all of ten standard high school texts and a good glossary.

LABORATORY EXERCISES IN GENETICS, by HOWARD A. ROYLE; Burgess Publishing Co., 426 South Sixth St., Minneapolis 15, Minn.; 1950, 53 pp., \$1.50 paper covers.

Handy little spiral-wire bound manual for the introductory course in genetics.

LABORATORY GUIDE TO THE ANATOMY OF THE RABBIT, by E. HORNE CRAIGIE; The Blakiston Co., 1012 Walnut St., Philadelphia 5, Pa.; 1951, 113 pp., 28 fig., \$3.25.

Twenty-one chapters, or exercises, some of them quite well subdivided, yet none of them overly long, make up this concise yet complete manual. The author is Professor of Comparative Anatomy and Neurology at the University of Toronto.

LABORATORY MANUAL OF ELEMENTARY ORGANIC CHEMISTRY, by GEORGE HOLMES RICHTER; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1951, 146 pp., paper covers.

QD261.R5 547.02 51-9410
This is the second edition of a modest-sized manual prepared by the Professor of Organic Chemistry at Rice Institute.

LABORATORY MANUAL FOR GENERAL BACTERIOLOGY, by G. E. PELTIER, C. E. GEORGI & L. F. LUNDGREN; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 293 pp., \$3.50 paper covers.

Fourth edition of spirally-bound laboratory text covering general field with special accent on health problems.

LIFE CYCLE OF THE DICYEMID MESOZOA, by BAYARD H. McCONAUGHEY; University of California Press, Berkeley, Calif.; 1951, 39 pp., 13 fig., 50¢ paper covers.

Interesting monograph on little known parasites on renal organs of cephalops.

LIMNOLOGY, by PAUL S. WELCH; McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y.; 1952, 538 pp., 56 tables, 50 fig., \$8.00.

QH96.W4 574.929 51-12655

This is the second edition of a standard and very well-known text. Not having our last edition here at hand for comparison purposes, we shall have to content ourselves with a brief summary of its better-than-average qualities. Among these is a 43-page bibliography and a lot of new data.

THE LORETTE SYSTEM OF PRUNING, by LOUIS LORETTE; Rodale Press, Emmaus, Pa.; 1946, 239 pp., 130 fig., \$3.00.

This is the first publication of the English translation of Lorette's revised eighth French edition. In it is a clear exposition of the system together with a large number of very convincing illustrations. There is an appended essay on a modified Lorette System by A. H. Lees based on a paper presented at the Royal Horticultural Society. The Lorette System aims to produce the maximum possible amount of fruit per limb per tree.

MAN IS A MICROCOSM, by J. A. V. BUTLER; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1950, 162 pp., \$3.00.

QH325.B84 577.2 51-1359
Dr. Butler, Head of the Department of Biophysical Chemistry at the Chester Beatty Research Hospital in London, was formerly a lecturer at the University of Edinburgh. He was a Rockefeller Fellow at Princeton for sometime and is also author of "Chemical Thermodynamics," now in its fourth edition. In this little book he attempts to reevaluate man from a scientist's point of view. His final chapter, — "The Stature of Man," — is thought provoking.

MANOMETRIC METHODS, by MALCOLM DIXON; Cambridge University Press, 32 East 57th St., New York 22, N. Y.; 1952, 167 pp., 20 fig., \$2.75.

This is the third edition of a handy sized manual dealing with the theory and techniques of this method now so often used in biological, biochemical, physiological and bacteriological research. The author is an authority on enzyme biochemistry in the University of Cambridge where he is a fellow of Kings College.

MAN ON HIS NATURE, by SIR CHARLES SHERRINGTON; Cambridge University Press, 32 East 57th St., New York 22, N. Y.; 1952, 300 pp., 7 plates, \$6.00.

QH349.S5 577 41-5413

The Gifford lectures of 1937-38 are here presented in a newly revised edition, in which a sturdy British biologist presents his philosophy. He bases his presentation on the work of Jean Fernel, a sixteenth century physician-philosopher.

MEASUREMENT OF RADIO ISOTOPES, by DENIS TAYLOR; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1951, 118 pp., illus., \$1.50.

QC795.T3 539.7 52-6151

Another little volume in Methuen's Series of Monographs on Physical Subjects. It deals with such practical subjects as the use of radioactivity measuring apparatus, counting systems, method of measurement and correction factors, and has a chapter on health hazards and radiation monitors.

METABOLISM AND FUNCTION IN NERVOUS TISSUE, edited by R. T. WILLIAMS; Cambridge University Press, 32 East 57th St., New York 22, N. Y.; 1952, 102 pp., \$2.75 paper covers.

Papers presented at the London School of Hygiene and Tropical Medicine, 10 November 1951, include carbohydrate metabolism in nerve tissue by R. V. Coxon, glutamic acid in relation to nerve tissue by H. Weil-Malherbe, phosphorylated and nucleotides in the central nerve system by H. McIlwain, lipids in the central nerve system by G. H. Sloane-Stanley, brain metabolism by D. Richter, biochemical aspects of the nerve tissue transport of ions by R. E. Davies and H. A. Krebs, and the use of isotopes in the study of nerve system metabolism.

MEXICAN BIRDS, by GEORGE M. SUTTON; University of Oklahoma Press, Norman, Okla.; 1951, 282 pp., 16 col. plates, 63 drawings, \$10.00.

QL686.S85 598.2972 51-14425

The present Curator of Birds and Associate Professor of Zoology at the University of Michigan here presents

the results of his travels throughout Mexico. No ornithological reference library can afford to miss this book.

MICROBIAL DECOMPOSITION OF CELLULOSE, by RALPH G. H. SIU has had plenty of opportunity to pursue the problems connected with fungal and bacterial reactions on cotton fabrics. This work sums up a great quantity of research which has not appeared in scientific publications. Each chapter has a complete bibliography. There are fifteen three-column pages of author index, twenty pages of two-column lists of microorganisms,—all of which should substantiate the comprehensiveness claimed for this work.

MIGRATION OF BIRDS, by FREDERICK C. LINCOLN; Doubleday & Co., Inc., 575 Madison St., New York 22, N. Y.; 1952, 102 pp., illus., \$1.00.

QL698.L479 598.2 52-5234

This slim little book by a well-known biologist on the Fish and Wildlife Service of the United States Department of the Interior is a mine of information on bird migration. Twenty-two of the forms discussed are illustrated with maps. Among the topics treated are: theories of migration, time, speed, altitude, objectives, routes and their evolution, perils, exhaustion, and weather.

THE MITOTIC CYCLE, by ARTHUR HUGHES; Academic Press, Inc., 125 East 23rd St., New York 10, N. Y.; 1952, 213 pp., 69 fig., 16 plates, \$6.00.

This new contribution to cytology (although the author does not wish it to be called a textbook of cytology) reviews recent progress in the study of the nucleus and cytoplasm during interphase and mitosis. In his work the author has been able to incorporate the help of Dr. Michael Swann (spindle fibers) and Dr. Charity Waymouth (growth mitosis and its stimuli). Chapter documentation runs very high, generally over 200 citations.

MODERN GARDENING, by P. P. PRONE; Simon & Schuster, Inc., Rockefeller Center, 1230 Sixth Ave., New York 20, N. Y.; 1952, 371 pp., \$3.50.

The publisher's "blurb" on the dust jacket of this book claims that it will show how to feed plants through their

leaves, slow down shrub and tree growth, spray weeds to death, speed vegetable and flower growth, etc. The author, who is plant pathologist at the New York Botanical Garden, does all the publishers claim and more. He has all the aggressiveness of a Paul de Kruif and much of his flair for happy expressiveness. The lists of commercial preparations are formidably complete.

MODERN TRENDS IN PHYSIOLOGY AND BIOCHEMISTRY, edited by E. S. GUZMAN BARRON; Academic Press, Inc., 125 East 23rd St., New York 10, N. Y.; 1952, 538 pp., fig., diag. plates, and portrait \$8.50.

QP71.B25 612.04 51-14025 rev.

Those of us who knew, admired and lamented the loss to science in the passing of Dr. Leonor Michaelis are glad that his friends at the Marine Biological Laboratory at Woods Hole have turned their planned *festschrift* into a memorial. They are Drs. Barron, Ballentine, Chance, Grundfest, Heilbrunn, Jacobs, Klotz, Kuffler, Loewi, Mazia, Mommaerts, Nachmansohn, Neurath, Paipart, Prosser, Runnstrom, Steinbach, Szent-Gyorgyi, Tobias, and Wald. Who better could present the modern trends in physiology and biochemistry?

THE MOLDS AND MAN, by CLYDE M. CHRISTENSEN; University of Minnesota Press, Minneapolis 14, Minn.; 1951, 244 pp., 6 fig., \$4.00.

QK601.C47 589.2 51-13547

This is an introduction to the fungi. Its author is Professor of Plant Pathology at the University of Minnesota. It is addressed to beginning students in mycology, as well as to those who want to acquaint themselves with the fungi in general. The author has a flair for introducing so many little-known but important sidelights that should make this book a best seller.

MORPHOLOGICAL AND ONTOGENETIC STUDIES OF UMBELLULARIA CALIFORNICA AND LAURUS NOBILIS, by BAKI KASAPLIGI; University of California Press, Berkeley, Calif.; 1951, 25 pp., 135 fig., \$1.50 paper covers.

Two of the primitive type woody *ranales* carefully studied with many illustrations.

MORPHOLOGY OF OSTRACOD MOLT STAGES, by ROBERT V. KESLING; University of Illinois Press, Urbana, Ill.; 1951, 324 pp., 96 plates, 5 charts, \$3.50 paper, \$4.50 cloth.

QL444.O8K4 595.33 51-62524

Monograph on a little understood and less studied group on which, as the author pointedly comments, "there is not an adequate description in the English language." The rise in micro-paleontological interests caused by the search for and discovery of new oil resources is focussing attention on living forms whose prehistoric remains challenge attention.

NATURAL SCIENCE AND THE SPIRITUAL LIFE, by JOHN BAILLIE; Charles Scribner's Sons, 597-599 Fifth Ave., New York 17, N. Y.; 1952, 43 pp., \$1.75.

The Rev. John Baillie, D.D., D.Litt, S.T.D., LL.D., here presents the Philosophical Discourse delivered before the British Association for the Advancement of Science on 12 August 1951 at Edinburgh. Dr. Baillie happens to be a Scotchman, the Principal of New College and Professor of Divinity at the University of Edinburgh. Dr. Baillie likewise knows his science as well as his divinity, and most of the background of science. He is clean-cut and uncompromising in his exposition of the unity of all knowledge, and that "if faith should languish, the scientific impulse would in the end languish no less." Shades of Lysenko!

NEW BIOLOGY, NO. 10, edited by M. L. JOHNSON & MICHAEL ABERCROMBIE; Penguin Books, Inc., 3300 Clipper Mill Road, Baltimore 11, Md.; 1951, 144 pp., 31 plates, 35¢.

This is the tenth of a continuing series of collected monographs dealing with various phases of biology. No. 10 covers the Amoeba, Isotopes, mimicry in British animals, instinct, the gannet, and the wetting of leaves,—and all for thirty-five cents.

NUTRITION AND CLIMATIC STUDIES, by H. H. MITCHELL & MARJORIE EDMAN; Charles C. Thomas, Pub., 301-327 East Lawrence Ave., Springfield, Ill.; 1951, 235 pp., 8 fig., 2 tables, \$6.75.

A51-4916

There are chapters on diet in a cold environment, in a hot environment, diet at altitude, and practical considerations. There is a 59-page bibliography, but no index.

NUTTALL'S TRAVELS INTO THE OLD NORTHWEST, by JEANETTE E. GRAUSTEIN; The Chronica Botanica Co., Waltham, Mass., and Stechert-Hafner, Inc., New York, N. Y.; 1950, 86 pp., 12 plates, 2 maps, \$3.00.

This paper-bound separate is No. 1/2 of Volume 14 of "Chronica Botanica" republished because of its topical interest. In 1810 Thomas Nuttall came to the United States from England to study and collect plants. On the tenth of April he started out from Philadelphia and in spite of almost constant malarial attack, traveled across Pennsylvania to Pittsburgh, thence to Erie, Cleveland, Sandusky, and Detroit. From the last place traveled to Mackinac Island by canoe, thence to Green Bay, up the Fox River, down the Wisconsin and the Mississippi to St. Louis. These brief notes are the reproduction of Nuttall's diary of the trip.

PAPERS IN MICROBIAL GENETICS, by JOSHUA LEDERBERG; University of Wisconsin Press, 811 State St., Madison 5, Wis.; 1951, 303 pp., illus., \$3.75.

QR84.L38 589.95 51-13684

This paper-bound work is a collection of side readings for a course in bacteriology. There are 21 papers in the volume, by such leaders as M. Demerec, C. F. Rabinow, H. B. Newcombe, B. Davis, D. W. Bruner

PAPERS OF THE MICHIGAN ACADEMY, Vol. 35, edited by EUGENE S. MCCARTNEY & FREDERICK K. SPARROW; University of Michigan Press, Ann Arbor, Mich.; 1951, 408 pp., illus., tables, and maps, \$7.00.

The papers read at the 1949 annual meeting of the Academy are here pre-

sented. There are four sections, the first on Botany and Forestry, then Zoology, followed by Geography and Geology. A general section closes the work.

PARASITISM AND SYMBIOSIS, by MAURICE CAULLERY; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1952, 340 pp., 80 fig., \$5.50.

This book, translated by Averil M. Lysaght, MSc., Ph.D., treats of parasitism, commensalism, mutualism and symbiosis, as different aspects of the same general laws by reviewing these types of association within the framework of the theory of evolution. It is one of the textbooks of animal biology edited by Julian S. Huxley.

PARROT FAMILY BIRDS, by JULIEN L. BRONSON; All Pets Magazine, Fond du Lac, Wis.; 1951, 104 pp.

SF473.P3B7 636.686 Agr 50-90

The revival of interest in the parrots as pets calls for something like this rather comprehensive little volume. Practically all the bird pets except the canaries are included, i.e., the crows, like the rooks and daws, even the starlings, which are used as pets in Europe and pests in the United States. There is a chapter on bird diseases in general and another on importation regulations.

PASTEUR'S STUDY OF FERMENTATION, edited by JAMES B. CONANT; Harvard University Press, Cambridge, Mass.; 1952, 58 pp., paper covers.

No. 6 in the Harvard Case Histories in experimental science, includes introduction on elementary biochemistry, story of Pasteur's early optical work, portion of his memoir on lactic fermentation, subsequent theories thereon, and Tyndall's lecture.

PATHOLOGY IN FOREST PRACTICE, by D. V. BAXTER; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 601 pp., 224 fig., \$7.50.

This is the second edition of the original 1943 work, brought up-to-date by expansion of the parts dealing with western white pine, the use of 2.4 D

and DDT, breeding trees to resist current diseases, etc.

PHARMACEUTICAL BOTANY, by HEBER W. YOUNGKEN; The Blakiston Co., 1012 Walnut St., Philadelphia 9, Pa.; 1951, 752 pp., 548 illus., \$7.00.
QK47Y7 580 51-3557

This is the newly-revised seventh edition rearranged for colleges where both liberal arts and prepharmacy students take the same beginning botany course together. There are separate chapters on the characteristics of drug yielding seed plants, as well as appendices on the microscope and its use, and also on histology.

PHARMACOGNOSY, by R. PRATT & H. W. YOUNGKEN; J. B. Lippincott Co., East Washington Sq., Philadelphia, Pa.; 1951, 644 pp., 67 fig., 40 tables, 10 charts, \$8.50.
RS160.P7 615.1 51-4141

This is another altogether new book which originates in the pharmacy colleges of the University of California and the University of Washington. The formation and use of the biosynthetic substances are followed in each case by the significance of the compounds as drug substances. As a reference as well as a text, the book should be a considerable value in the biology library.

PHILOSOPHICAL ASPECTS OF MODERN SCIENCE, by C. E. M. JOAD; George Allen & Unwin, Ltd., Ruskin House, 40 Museum St., Strand, London, WC.1; 1948, 344 pp.
Q175.J6 501 32-22725

In this book the British philosopher pulls no punches. He does not agree with all the pooh-bahs of this epoch. In fact, he takes right out after them and neatly dissects them. After discussing many modern theories, the author ends up with his own views on the status of the physical world and the relations between scientific objects and the physical world.

PHILOSOPHY OF NATURE, by JACQUES MARITAIN; Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y.; 1951, 198 pp., \$3.00.
BD581.M313 113 51-12847

The scholarly Professor of Thomistic Philosophy here attempts to answer the questions: What is the philosophy of nature? How is it related to the sciences and to metaphysics? There are only three chapters,—the first on the ancient philosophers and their conception of the subject, then comes the positivistic approach, and finally the Thomistic position. Yves Simon's appreciation of Maritain's philosophy of science is added as an appendix for good measure.

PHOSPHORUS METABOLISM, edited by W. D. McELROY & B. GLASS; The John Hopkins Press, Baltimore 18, Md.; 1951, 762 pp., w. text fig., \$10.00.
QP171.S87 612.01531 51-14986

The symposium held at Johns Hopkins, 18-21 June 1951, is here reported. Some fifty collaborators and some forty other assistants participated. The various papers are grouped under the following ten headings: metabolism of polysaccharides and disaccharides, metabolism of hexosephosphates, metabolism of pentose and triose phosphates, recent investigations on the formation and use of active acetate, oxidative phosphorylation during electron transport, metabolism of phosphorus-containing coenzymes, biochemistry of inorganic pyrophosphates and metaphosphates, influence of inorganic ions on phosphorylation reactions, the chemistry and thermodynamics of phosphate bonds, and utilization of phosphate bond energy.

THE PLANT WORLD, by HENRY J. FULLER; Henry Holt & Co., Inc., 257 Fourth Ave., New York 10, N. Y.; 1951, 769 pp., illus., \$4.75.
QK47.F88 580 51-11528

This is the first revised edition of the so-called "Illinois Botany Text." It has been expanded at several points as the users of the first edition requested. There are two appendices, one on hydroponic gardening and the other on parthenocarpy. The illustrations are numbered by the chapters according to the latest fad among the atomic fission people.

THE PHYSIOLOGY OF THE FUNGI, by V. G. LILLY & H. L. BARNETT; McGraw-Hill Book Co., Inc., 330 West

42nd St., New York 18, N. Y.; 1951, 464 pp., 81 fig., 64 tables, \$7.50.

QK601.L5 589.2 51-12078

A text for advanced students, which is not an introductory volume.

POWELL OF THE COLORADO, by WILLIAM C. DARRAH; Princeton University Press, Princeton, N. J.; 1951, 426 pp., 17 illus., \$6.00.

Q143.P8D25 925 51-11671

The John Wesley Powell who sparked the United States Geological Survey, the Bureau of American Ethnology and the Bureau of Reclamation into existence is here memorialized by one of the nation's best-known geologists and paleobotanists, Dr. William C. Darrah. This is probably one of the best of last year's biographies. It fills in the story of the opening of the Colorado River.

PREHISTORIC AMERICA, by ANNE T. WHITE; Random House, Inc., 457 Madison Ave., New York 22, N. Y.; 1951, 182 pp., \$1.50.

QE746.W46 560.973 51-13573

Another book in the excellent Landmark series for young people, this one dealing with the various types of plant and animal life which lived in North America from the dawn of life until about 1200 A.D. Grand reading for inquisitive youngsters.

PREVENTIVE MEDICINE AND HYGIENE, Rosenau, edited by KENNETH F. MAXCY; Appleton-Century-Crofts, Inc., 35 West 32nd St., New York 1, N. Y.; 1951, 1462 pp., illus.

RA425.R78 613 51-8004

This is the seventh revised edition of Milton J. Rosenau's more or less classic and monumental work. Its 51 chapters are the work of some 26 collaborators, most of whom are leaders in the field of public health. Its revision and republication is a tribute at once to the original author's memory as well as to the thoroughly awakened interest of the generality of our people in preventive medicine and public health.

PRINCIPLES OF GENERAL BIOLOGY, by MARY S. GARDINER; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1952, 657 pp., illus., \$5.25.

QH308.G3 574 52-6695

Authored by the Professor of Biology at Bryn Mawr College, this book represents the author's approach to her subject in her college courses. The book has four sections—the organization of the natural world, the organization of biological systems, the operation of biological systems, and the evolution of biological systems.

PRINCIPLES OF PLANT PHYSIOLOGY by JAMES BONNER & A. W. GALSTON; W. H. Freeman & Co., San Francisco, Calif.; 1952, 509 pp., 219 illus., \$5.50.

QK711.B577 581.1 52-7248

This book aims to build on knowledge of at least a freshman course in biology and in chemistry. It is planned for an elementary one semester or two-quarter program. The authors have aimed at clarity above everything. Even the illustrations are unusually clear-cut.

PRINCIPLES OF MICROBIOLOGY, by CHARLES F. CARTER; C. V. Mosby Co., 3027 Washington Ave., St. Louis, Mo.; 1951, 514 pp., 136 fig., \$4.50.

QR46.C35 616.01 51-10703

This is a survey of microbiological principles, describing the more important pathogens and their effects on the animal body. It also treats of the economic importance of the nonpathogenic microorganisms. The author is the director of a southern clinical laboratory.

RADIOISOTOPES, INDUSTRIAL APPLICATIONS, by G. H. GUEST; Pitman Publishing Corp., 2-6 West 45th St., New York 19, N. Y.; 1951, 185 pp., 65 fig., 9 tables.

TK9145.G8 541.2 51-11330

Possible applications of radioisotopes to industrial situations form the theme of this book. Typical chapters include the use of radioisotopes in metallurgy, in ceramics and in processing chemicals.

RANGE MANAGEMENT, by ARTHUR W. SAMPSON; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 570 pp., 111 fig., 38 tables, 2 color plates, \$7.50.

SF85.S33 638.08423 51-13123

This textbook, long in production, has been tried out in classes in agriculture, botany, forestry, and geography. It is claimed to be the "most exhaustive study of its kind in print. The author is Professor of Forestry (Range Management) at the University of California. His thesis is that the West is not receiving maximum returns from the livestock industry. How to check excesses on all sides and guarantee adequate results is the author's purpose.

SCIENCE IN PROGRESS, Vol. VII, edited by GEORGE A. BAITSELL; Yale University Press, New Haven, Conn.; 1951, 512 pp., 118 fig., 3 tables; \$6.00.

Q171.S582 508 39-14778

This seventh series of articles on the modern scientific scene includes, among others, such stimulating articles as B. M. Patten on the first embryonic heart beats, H. J. Muller on radiation damage to genetic material, atomic and solar energy by Farrington Daniels, and a history of the fauna of Latin America by George Gaylord Simpson.

SCIENCE NEWS, No. 22, edited by A. W. HASLETT; Penguin Books, Inc., 3300 Clipper Mill Rd., Baltimore 11, Md.; 1951, 128 pp., 26 plates, 50¢.

Another Penguin Book series is known as Science News, and covers a considerably wider field than the New Biology Series. No. 22 contains authoritative articles on muscular activity patterns, mind pictures, color measurement, acceleration of charged particles, photosynthesis, the 1950 Assam earthquake, hurricanes, and the research report as summarized by the editor.

SEA ANIMALS AND HOW TO DRAW THEM, by AMY HOGEBOOM; The Vanguard Press, Inc., 424 Madison Ave., New York 17, N. Y.; 1951, 39 pp., illus., \$1.75.

NC780.H64 743.6 51-6014

This is the ninth in a series of children's drawing books,—which certainly would require precocious youngsters to appreciate. The author's techniques are here applied to the whale, dolphin, bear, turtle, shark, walrus, penguin, crocodile and seal.

THE SEA AROUND US, by RACHEL L. CARSON; Oxford University Press, 114 Fifth Ave., New York 11, N. Y.; 1951, 230 pp., w. maps, \$3.50.

GC21.C3 551.46 51-10430

After all the publicity this book has received, anything that might be added here would be gilding the lily. The author is Editor-in-chief of the United States Fish and Wild Life Service.

THE SHELL BOOK, by JULIA E. ROGERS; Charles T. Branford Co., 6 Beacon St., Boston 16, Mass., 1951, 503 pp., 8 pp. of color plates, 86 pp. of illus., \$6.95.

This is the original 1908 work republished with the addition of many new illustrations as well as a revised list of modern names. These are all added to the end of the book as Dr. Paul Bartsch, the Head of the Division of Mollusks in the Smithsonian Institution, objected to changing a word of the original text.

SOILS, by G. W. ROBINSON; John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y.; 1949, 573 pp., 22 fig., 9 plates.

S591.R645 631.4 50-58000 rev.

Here is a manual which originated in Britain at the University College of Wales twenty years ago and has now come to its third edition. It has a world viewpoint and treats equally freely of soils in the United States as well as the other parts of the world and does not seem to bear down especially on those of the British Commonwealth. As such, the book is acceptable reference material for the world geographer and ecologist.

STUDY OF INSTINCT, by N. TINBERGEN; Oxford University Press, 114 Fifth Ave., New York 11, N. Y.; 1952, 228 pp., 130 fig., \$7.00.

The author of this work is lecturer in animal behavior at Oxford. Under the auspices of the American Museum of Natural History and Columbia University, he delivered a series of lectures in New York just five years ago. This book is an enlarged version of those lectures. It is intended for students of zoology, but psychologists and physiologists may find it equally interesting.

SURVEY OF MARINE FISHERIES OF NORTH CAROLINA, by HARDEN F. TAYLOR; University of North Carolina Press, Chapel Hill, N. C.; 1951, 555 pp., with tables, maps, fig., \$10.00.
SH222N8N6 338.372 51-9498

This is an elaborate study which covers the hydrography of the marine waters off North Carolina, the biology and the natural history of important fish species, and the general economics of the state fisheries. Under the chairmanship of Dr. Robert E. Coker, a large committee of leading authorities in North Carolina has compiled a provocative report of interest not only to North Carolinians but to all who have the interests of marine fisheries at heart.

THE SYMBOLISM OF FLOWERS, by EDWARD A. CLARK; Dorrance & Co., 364-376 Drexel Bldg., 5th & Chestnut, Philadelphia 6, Pa.; 1952, 72 pp., \$2.00.

PS3505.L253S9 811.5 52-7428

A slim little book of verses which begins with several short and ethereal ones on flowers. There are some stronger poems in the midsection, but the last verses are definitely a let-down, the youthful, or better juvenile, productions of an amateur. They should have been left out.

TEXTBOOK OF BACTERIOLOGY, by JOSEPH M DOUGHERTY & ANTHONY J. LAMBERTI; The C. V. Mosby Co., 3027 Washington Ave., St. Louis, Mo.; 1950, 491 pp., 141 fig., 14 tables, \$5.75.

QR46.D63 616.01 50-7922

This is the second edition of a textbook originally published in 1945. Its authors are members of the staff of Villanova College and Temple University Departments of Bacteriology. It is designed for use in medical and dental schools as a preparatory course to medical schools proper. The book is being recommended by its introducer for nurses' training schools because of its simple and direct style.

TEXTBOOK OF BIOCHEMISTRY, by E. S. WEST & W. R. TODD; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.; 1951, 1345 pp., 139 tables, 56 fig., some in color, \$12.00.

QP514.W38 612.015 51-7353

Back in the middle years of "Big Two," there appeared over the senior author's name a new text called "Physical Chemistry for Students of Biochemistry and Medicine." This has now been expanded by Drs. Edward Staunton West, Professor of Biochemistry, and Wilbert R. Todd, Associate Professor of Biochemistry at the University of Oregon Medical School. The book is richly implemented by up-to-date bibliographies, which are frequently referred to. As a text the book is massive, probably far more extensive than might be thought necessary, but the authors very intelligently decided to include enough information to stimulate students to further work.

TEXTBOOK OF EVOLUTION, by EDWARD O. DODSON; W. B. Saunders Co., West Washington Square, Philadelphia, Pa.; 1952, 419 pp., 101 fig., 3 tables, \$5.00.

This book by the Assistant Professor of Zoology at the University of Notre Dame is dedicated to Professors E. B. Babcock and R. B. Goldschmidt. A critical review in the brief area allotted here would be impossible as well as out of keeping with the policy of this magazine. The Editor, however, hopes that complete and detailed reviews will be forthcoming shortly. There has not been a good new work on evolution synthesizing the results of modern research for nearly a score of years. This work might be the candidate for the honors.

TEXTBOOK OF GENERAL PHYSIOLOGY, by HUGH DAVSON; The Blakiston Co., 1012 Walnut St., Philadelphia 5, Pa.; 1951, 659 pp., 288 illus., \$7.00.

Dr. Davson belongs to the scientific staff of the Medical Research Council and is Honorary Research Associate, University College, London. The book aims to serve as a text for premedical as well as general biology students in background physiology. The book has seven main divisions: the structural basis of living matter; transformation of energy; transport of water and solutes; characteristics of excitable tissue; mechanism of muscle contraction and the effect of light on the organism and its emission therefrom.

TEXTBOOK OF HISTOLOGY, by E. V. COWDRY; Lea & Febiger, Washington Square, Philadelphia, Pa.; 1950, 640 pp., 837 illus.

QM551.C65 611.018 50-14256
 Subtitled "Functional Significance of Cells and Intercellular Substances," this fourth edition has been increased by over 200 pages more than the third, and by at least a score more illustrations. One feature is the introduction of newer ideas based on electron microscopy.

TROPICAL FISH AS A HOBBY, by H. A. AXELROD; The McGraw-Hill Book Co., Inc., 330 West 42nd St., New York; 1952, 264 pp., illus., \$4.00.

QL78.A9 590.74 51-12554
 With the help of Dr. Myron Gordon of the New York Zoological Society, and James W. Atz, Curator, New York Aquarium, the author presents another one of those practical as well as informative volumes based on the desires of fish hobbyists. There are chapters on breeding and genetics, nomenclature and the balanced aquarium myth.

UNDERSTANDING HEREDITY, by RICHARD GOLDSCHMIDT; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.; 1952, 228 pp., 49 fig., \$3.75.

This introduction to genetics by the former National President of Phi Sigma is a more popular presentation of the subject designed to give curious people a better understanding of the subject. It is felt that only the widest diffusion of knowledge on this subject will successfully combat the latest scientific heresies emanating from Dr. Lysenko's laboratories behind the iron curtain.

WATERFOWL AND THEIR FOOD PLANTS IN WASHINGTON, by CHARLES F. YOCUM; University of Washington Press, Seattle 5, Washington; 1951, 272 pp., 63 fig., 48 plates, 47 tables, \$5.00.

QL684.W2Y6 598.41 51-14536
 This is an ecological as well as conservation work of considerable value to ornithologists and hunters. Most of the records are from the eastern part of the state.

THE WHITE LADY, by LEONARD DUBKIN; G. P. Putnam's Sons, 210 Madison Ave., New York, N. Y.; 1952, 165 pp., w. sketches, \$3.00.

QL795.B3D8 599.4 52-5276
 All about the author's adventures with an albino bat. Guaranteed to stick to your hands until you finish it, no matter how or when.

WILD FLOWERS AT A GLANCE, by M. C. CAREY & D. FITCHEW; Pellegrini & Cudahy, 41 East 50th St., New York 22, N. Y.; 1950, 275 pp., 264 color plates, \$2.75.

QK306.C34 581.942 50-3851
 Although printed in Great Britain, a very substantial number of the British forms illustrated and described are common in Canada and the United States. We missed such common United States forms as *Hepatica*, *Liatris*, *Lobelia*, *Monarda* and others. The flowers are grouped by colors, from white, through greenish-white, green or greenish yellow, to yellow, then blue, and finally red, shades of pink or purple. The introduction is by Dr. H. K. Svenson, Forestry and Botany Curator of the American Museum of Natural History. The distribution of each form is given.

WOOD BIRDS OF MICHIGAN, by NORMAN A. WOOD; University of Michigan Press, Ann Arbor, Mich.; 1951, 559 pp., 16 plates, 1 map, \$4.00.

QL684.M5W6 598.29774 51-14203
 This large, well-printed, paper-bound volume contains the life work of one of Michigan's distinguished naturalists who died in 1943. Three hundred and thirty-four forms of bird life are presented, 202 of which are known to have bred at least once in the state. The illustrations are the sort of thing which would turn any bird photographer green with envy.

ZOOLOGY, by ALFRED M. ELLIOT; Appleton-Century-Crofts, Inc., 35 West 32nd St., New York 1, N. Y.; 1952, 719 pp., \$6.00.

This new college text is divided into seven main parts: zoology as a science, the beginning and nature of life, the organized animal, the use of animal life, organ systems of man, the continuity of life, and organic evolution.

Separates Received

Many of these are too small for individual summaries.

LAKE STATES FOREST EXPERIMENT STATION, University Farm, St. Paul 1, Minn. Twenty-eighth Annual Report, by M. B. Dickerman, Lake States Forests Experiment Station.

Quality of Logs from Improvement Cuts in Second Growth Hardwoods, by Carl Arbogast, Jr. (Station Paper No. 26, December 1951)

Technical Notes:

No. 366: Thinning Young Oak Stands for Fuel.

No. 367: Cost and Effects of Chemical Release of Pine.

No. 368: Jack Pine Reproduction Affected by Age of Parent Tree.

No. 369: Ungrazed Farm Wood Lots in Minnesota.

No. 370: 1951 Tree Seed Crops.

No. 371: Second-Growth Woodland Can Be a Financial Asset to the Farm.

No. 372: Disking to Regenerate Pulpwood Species.

No. 373: Seed Production of a White Spruce Tree.

No. 374: Labor Costs for Thinning.

No. 375: Mill-Scale Log Rule.

Publications of the Lake States Experiment Station.

(Station Paper No. 15, Supplement No. 1, January 1952)

UNIVERSITY OF KANSAS MUSEUM OF NATURAL HISTORY PUBLICATION.

University of Kansas, Lawrence, Kansas.

Vol. III:

No. 2: Quantitative Study of Bird Nocturnal Migration, by George H. Lowery, Jr.

Vol 3:

No. 3: Phylogeny of the Waxwings and Allied Birds, by M. Dale Arvey.

Vol. 5:

No. 4: Mammals from Barrier Beach, Tamaulipas, Mexico, by E. Raymond Hall.

No. 5: Taxonomy and Distribution of Rabbits, by E. R. Hall & K. E. Nelson.

No. 6: Two Subspecies of *Thomomys bottae*, by Keith E. Nelson.

No. 7: New Subspecies of *Microtus Montanus*, etc., by E. R. Hall & K. E. Nelson.

No. 8: New Pocket Gopher from Eastern Colorado, by E. Raymond Hall.

No. 9: Mammals along the Alaskan Highway, by Rollin H. Baker.

No. 10: Synopsis of N. American Lagomorpha, by E. Raymond Hall.

No. 11: New Pocket Mouse from Kansas, by E. Lendell Cockrum.

No. 12: Mammals from Tamaulipas, Mexico, by Rollin H. Baker.

No. 13: New Pocket Gopher from Wyoming & Colorado, by E. Raymond Hall.

No. 14: New Name for Mexican Red Bat, by E. Raymond Hall.



Acceleration at Goucher

Goucher College has announced the awarding of Presidential Grants of full tuition for two years, to four of the young girls who were alternates for the full Ford Scholarships. These young ladies, between the ages of fifteen and sixteen and a half, will take part in the educational project made possible by the \$108,400 grant which Goucher College received from the Fund for the Advancement of Education of the Ford Foundation. The pur-

pose of this project, which is similar to those being carried out under Ford grants at Yale, Columbia University, Chicago University and the University of Wisconsin, is to determine whether unusually talented young women between the ages of fifteen and sixteen and a half may not profit from acceleration of their education after they have completed the tenth grade. Goucher is the first woman's college to receive such a grant.

ENTRE NOUS

In the Editor's Mail

YALE UNIVERSITY
CONSERVATION PROGRAM

March 7, 1952

Dear Anselm:

Thank you indeed for the extremely lively and interesting number of the *Biologist* which is just at hand. I see that you get even better as time goes on.

With best wishes, I remain
Very truly yours,
Paul B. Sears

UNIVERSITY OF SOUTHERN
CALIFORNIA

3518 University Avenue
LOS ANGELES 7,

April 3, 1952

Dear Dr. Keefe:

I appreciated reading the September-December issue of "*The Biologist*" as it started out with an article by Dr. Van Cleave, whom I knew years ago at the University of Illinois. I would like very much to submit an article in the future for "*The Biologist*." It would probably not get in until next year. I am also attracted by the possibility of the "Letters to the Editor" section. I believe that the congratulatory letters you received on the previous issue were well merited and I hope that all of the future copies will measure up to your excellent standard.

Sincerely yours,
M. D. Appleman, Chairman
Department of Bacteriology

COLLEGE OF AGRICULTURE
Division of Plant Pathology
UNIVERSITY OF CALIFORNIA
BERKELEY

May 9, 1951

My dear Dr. Keefe:

Thank you for your letter of February 12 and the copies of "*The Biologist*." By including more research and discussion papers and making reprints available you have made this a more important journal. You deserve great

credit for this and for doing a good editorial job.

The university libraries should be encouraged to bind "*The Biologist*" and maintain it among their journal sets. This will make it a permanent repository of research, as Dr. Keitt used to tell us.

I enclose a five-year subscription.

Sincerely yours,
M. W. Gardner

Dear Sir:

Thank you for your letter dated 12 March 1952. It was read at the next general meeting of the chapter, after I received it and, although it was received favorably, there have been no contributions submitted to me for publication in *The Biologist*. I hope that the future will be more productive, and you may feel assured that I will do as much as I can to arouse the interest of the members to submit material to our publication.

In reference to the matter of a new section in *The Biologist* for letters from the members, it is generally felt, I think, that if the section could be as it was, as you say, 'in the twenties,' and not as a 'gripe column,' it could be a valuable addition, as well as an interesting one, to the fraternal publication.

There are a couple of 'ifs,' however, that I should personally consider: if the tendency of the letters received for publication are not the desirable type, they should be withheld and not printed. In order to let the subscribers of *The Biologist* know that this method of selection is to be the policy, it should be so stated at the head of that section in the journal. This may sound rather stilted, but it may work. The other consideration is that if the section seems not to justify the space it utilizes, that it should be discontinued. This, I think, is obvious.

Nicholas Nader,
Editor, Sigma Chapter

9411 Portage Lake Road
Pinckney, Michigan
26 April, 1952

Dr. Anselm M. Keefe
St. Norbert College
West DePere, Wis.

Dear Dr. Keefe:

Your letter of 12 March has been turned over to me and with it the responsibility of digging up articles for

"*The Biologist*." To date my efforts in this capacity have brought no results. However, I am including a brief item which might do for chapter news.

I concur whole heartedly with your ideas regarding a section of "*The Biologist*" for letters from the membership. It could be a useful means of exchanging information.

Respectfully yours,
Kent H. McKnight



Liberal Education Desired for All

The liberal arts college is one of the greatest bulwarks of the free world against communist slavery. Those wise men in the Politburo know this. Skilled beyond any Greek sophists in making the worse appear the better reason, they fear the product of an institution which has no objective other than to preach the truth. Doubtless if the Russians had the time they would consider it more profitable to destroy our colleges than to bomb our atomic installations.

That brings up the question: Do we Americans value our liberal arts education as highly as we should at a crisis such as the present, or are we, on the approach of war, prone to wish that we had steered our young men into the assembly lines of vocational training?

This conflict between liberal and vocational training is not new in American education. Indeed, the movement to make liberal training more utilitarian started over a century ago. The result has been, says the editor of *School and Society* glumly, the proliferation of courses, and the development of specious arguments,—that liberal education is vocational and vocational training can be liberal—to the detriment of both.

Liberal education, etymologically

speaking, is the education of the free man (*liber*), in a society predicated on slavery or an inferior class, where manual labor and menial tasks were not the concern of the free man—as for example, in Greece or Rome. This Greco-Roman education was the education of the ruling class. The arts and sciences which taught man how to rule were the substance of the curriculum. Liberal education, then, is not training for banking, or manufacturing, or cotton growing. In a polity consisting of rulers and the ruled, liberal education is the prerogative of the former, the best (cf. aristocracy, rule by the best). . . . It was merely the right discipline for whoever was to rule.

If we apply this conception of liberal education to the United States, who are the rulers, and who, being rulers, must have this education? Former Chancellor Hutchins of Chicago, in a speech last year, answered this question rather persuasively. Our democracy is based on universal suffrage. Universal suffrage makes every citizen a ruler. This is the crux of the matter. If liberal education is the education of the rulers, then every American must have a liberal education.—W. S. Messer, in *Dartmouth Alumni Magazine*.



CHAPTER OFFICERS and NEWS

BETA

—University of Michigan
Ann Arbor Michigan

President—P. C. Rajam, Dep't. of Bacteriology, Univ. of Michigan.

Vice-Pres.—Albert Grover, Dep't. of Bacteriology, Univ. of Michigan.

Corr. Sec.—Kenneth W. Walls, Dep't. of Bacteriology, Univ. of Michigan.

Rec. Sec.—Roberta Burkhardt, Dep't. of Zoology, Univ. of Michigan.

Treasurer—Gerard VanHalsema, Dep't. of Bacteriology, Univ. of Michigan.

Editor—Kent H. McKnight, Dep't. of Botany, Univ. of Michigan.

Guest speaker for the evening was Dr. Baylor of the Zoology Department of the University of Michigan, who spoke on "The Biology of Viruses."

The sixth annual Phi Sigma Photo-Art Exhibit which ran for two weeks in late March once again featured an outstanding series of water color paintings of birds by Dr. George M. Sutton. Recent field studies in Mexico provided the subject matter for Dr. Sutton's paintings which were rendered with meticulous accuracy. Once again his keen ability to portray birds and environment with lifelike detail was the delight of many who viewed the exhibit.

A most interesting feature of this years exhibit was the extreme variety of subject matter and techniques which were shown. The subjects illustrated ranged from molluscs to human anatomy—from fungi to reptiles. Techniques exhibited included water colors, oils, pen and ink, air brush, pencil dust and photography. In fact representatives of almost every illustrating tool available to the scientist were shown.

Robert Mengel and Dick Grosenheider hung additional water colors of birds and mammals. Very effective use of water color and air brush was shown by William Bruden in a series of illustrations of plant diseases featuring a most striking blending of vibrant colors. Once again the best in

pencil dust technique was shown in the work of Grace Eager. This consisted of a group of molluscs which were illustrated with unbelievable accuracy. Effective use of scratchboard technique was shown by Robert S. Butsch.

Included also were a group of miscellaneous drawings by Cecelia Bannell; water colors by William Lunk; and photographs of reptiles by William E. Duellman; as well as a group of classroom drawings prepared by students in the histology and embryology courses of the Zoology department. Many other meritorious contributions were submitted in this years exhibit which filled three galleries. These annual exhibits have always attracted considerable interest locally—not only among biologists at the University, but among townspeople as well.

Kent H. McKnight, Editor.

EPSILON

—University of Denver
Denver, Colorado

President—David Breternitz, 2041 So. Vine, Denver 10, Colorado.

Vice-Pres.—Nicholas Keller, Rt. No. 1, Box 440, Arvada, Colorado.

Corr. Sec. & Rec. Sec.—Gwen A. Schultz, 1115 Logan, Apt. 110, Denver 3, Colorado.

Treasurer—John Ness, 1801 Bellaire, Denver, Colorado.

Editor & Council Rep.—Dr. Frederick Zeiner, 1417 So. Elizabeth, Denver, Colorado.

We had five meetings during our winter quarter. On the seventh of February eleven new members were initiated into our chapter at a banquet meeting. At our initiation banquet Dr. Helen Zeiner spoke on "Grasses, Familiar and Exotic." Our meeting of February 21 was taken over by Renee Choitz who spoke to us concerning her research project "Mineral Deficiencies in African Violets." The last meeting of the winter quarter composed of two student talks. Rudolph DeLuise spoke

on "Afferent Pathways of the Vagus Nerve," and Louis Smith discussed "Extra-embryonic Mesoderm."

Thirteen persons have been invited to our chapter and they will be guests at our regular meeting to be held April 9th. We hope to be able to initiate these persons on the 7th of May.

Epilson wishes to pass on their compliments on the September-December issue of "*The Biologist*." We all thought it was swell.

David Breternitz,
President, Epilson Chapter.

ZETA

—University of Wisconsin
Madison Wisconsin

President—Derald A. Slack, Dept. of Plant Pathology, Univ. of Wis., Madison 6, Wis.

Vice-Pres.—Sherman Watson, Dept. of Medical Physiology, Madison, Wisconsin.

Corr. Sec.—George W. Keitt, Jr., Plant Physiology, Madison, Wisconsin.

Rec. Sec.—Rose Rozich, Dept. of Zoology, Univ. of Wis., Madison 6, Wis.

Treasurer—Billy L. Sims, Dept. of Horticulture, Univ. of Wis., Madison 6, Wis.

Editor—David E. Kay, Dept. of Agronomy, Univ. of Wis., Madison 6, Wis.

Council Rep.—O. N. Allen, Agr. Bacteriology.

The Zeta chapter of Phi Sigma society is at present engaged in the selection of candidates for membership. Stanley Weinreb of the Zoology department is serving as co-chairman of the membership committee with our vice president Sherman Watson. The committee is made up of members representing the various departments with biological foundations at the University. Plans for the initiation banquet are progressing. The date of the banquet is tentatively set for the first week in May. Lotus Simon of Zoology is chairman of the banquet committee.

Two of our chapter officers terminated their education at the University with the end of the Fall semester, necessitating a special election. A nominating committee headed by James Bloom submitted a slate of prospective

officers. Stephen J. Warnock was elected treasurer, and Herbert R. Heinecke was elected Editor. Mr. Warnock is in the Agronomy department, and Mr. Heinecke is in the department of Biochemistry.

In addition to meetings of the membership, the Zeta chapter has sponsored lectures open to the public. The first of these featured Dr. David E. Green, director of the Enzyme Institute, on the subject "Some Studies on Organized Enzyme Systems." More recently, Dr. Joshua Lederberg, Genetics department, spoke on the subject "Genetics of Bacteria." These two men are pioneers in their respective fields and attracted much attention around the campus.

I have contacted individuals concerning topics of special interest suitable for publication in the Biologist. Such manuscripts should be available to you soon.

Since the distribution of the latest Biologist, I have received inquiries as to the spelling of my last name. Evidently a misspelling was made. I would like to comment, however, on the excellence of the journal. The article by Carl LaRue has been the recipient of much favorable comment in particular.

Derald A. Slack, Pres.

ETA

—University of Akron
Akron, Ohio

President—Patricia Waldron, Dept. Biology, University of Akron, Akron, Ohio.

Vice-Pres.—Barbara Price, Dept. of Biology, University of Akron, Akron, Ohio.

Corr. Sec. & Rec. Sec.—Lois Hunsicker, Dept. of Biology, University of Akron, Akron, Ohio.

Treasurer—Richard A. Pamplin, Dept. of Biol., University of Akron, Akron, Ohio.

Council Rep.—Dr. W. C. Kraatz, Dept. of Biology.

This account of chapter proceedings carries on from our last report in the May 1951 issue, though our officers were also listed in the Sept.-Dec. 1951 issue.

In a meeting of July 22, 1951 Bryan Carpenter, Conrad Gutemuth, Lois Hunsicker, and Richard Pamplin were initiated into membership.

In a fall meeting, Oct. 22, 1951, a new faculty member was initiated. She is Dr. Dorothy I. Biesinger, Ph.D. Ohio State 1951, who is teaching courses in physiology and genetics. Also one student, Patricia Wolff was initiated.

In a March meeting, March 2, Mrs. Elizabeth Sebring was initiated into membership and seven students were pledged.

The Phi Sigma Award for the year was given to Richard A. Pamplin.

Dr. Dorothy I. Biesinger was co-author with Dr. H. B. Goodrich of Wesleyan University, of a paper, *Histology and Regeneration of Color Patterns in certain tropical marine fish*, at the American Society of Zoologists meeting, meeting with the A.A.A.S. at Philadelphia in Dec. 1951.

Dr. Walter C. Kraatz, Head of the Department of Biology was chosen Vice-President for the Section A, Zoology and Mr. Fred H. Glenny, B.S. 1936 and M.S. 1940, of Ohio State University was chosen Vice-President of Section L, Conservation, at the annual meeting of the Ohio Academy of Science at Kent, Ohio, April 18, 1952.

KAPPA

—University of Kansas
Lawrence, Kansas

President—Richard White, Physiology Dept., Univ. of Kansas, Lawrence, Kansas.

Vice-Pres.—Keith Wolfenbarger, Entomology Dept., Univ. of Kansas, Lawrence, Kansas.

Corr. Sec.—Mary Jane Taylor, Bacteriology Dept. Univ. of Kansas, Lawrence, Kansas.

Rec. Sec.—Eugene B. Wittlake, Botany Dept., Univ. of Kansas, Lawrence, Kansas.

Treasurer—Reed Roberts, Entomology Dept., Univ. of Kansas, Lawrence, Kansas.

Editor—Katsuyuki Yokoyama, Botany Dept., Univ. of Kansas, Lawrence, Kansas.

Council Rep.—Mrs. Ruth E. McNair, Biology Dept., Univ. of Kansas, Lawrence, Kansas.

New officers were installed and fifteen new members were initiated at the annual Kappa chapter banquet at the University of Kansas. Dr. Harley J. Van Cleave, Honorary national president, was the guest speaker. He spoke on the "Development of Natural History in New Harmony, Indiana." Earlier in the afternoon he conducted a seminar on "The morphological Studies of Acanthocephala."

Katsuyuki Yokoyama,
Editor

LAMBDA

—Montana State University
Missoula, Montana

President—Robert Murray, Corbin Hall, Missoula, Montana.

Vice-Pres.—Charles Waterman, Corbin Hall, Missoula, Montana.

Corr. Sec.—Ruth Scott, 601 Daly, Missoula, Montana.

Rec. Sec. Treasurer—Lyle Shoemaker, 540 McLeod, Missoula, Montana.

Editor—Dale Benson, 3rd and Curtis St., Missoula, Montana.

Council Rep.—Dr. L. G. Browman, Zoology Dept., M.S.U.

During the last two quarters, members and guests of Lambda Chapter have heard a series of very excellent speakers at our bi-monthly meetings. Dr. George F. Weisel, Assistant Professor of Zoology, presented an inspiring lecture on "Fish Hybrids"; Mr. E. E. Jeffers, Assistant Professor of Bacteriology, discussed various aspects of "Bacterial Genetics and Variations"; Dr. Melvin S. Morris, Professor of Forestry, reported on "Research Work in Wildlife Management Being Done in This Area of the Northwest"; and Dr. Muriel R. Loran, Assistant Professor of Pharmacy, discussed her research in cancer investigation. One of the graduate students in the School of Forestry, Danny On, who has been working on tetrazolium chloride as a viability indicator of certain coniferous seeds for the last couple of years, interestingly described his progress in the "Chemical Testing of Seed Germination." Chuck Waterman, also a graduate student who is completing the work for his master's degree, spoke

on his thesis, "The Effects of Thinning Young Douglas Fir."

Six new members were informally initiated into Lambda Chapter of Phi Sigma this spring. These were: Lois Jean Baker, Marjorie C. Holden, Mary Joyce Quinn, John R. Peterson, Richard A. Solberg, and Kenneth C. Haffly. At the formal initiation banquet, all were honored to have as speaker, Fred Johnson, Chief of Wild Life Management for Region One of the Forest Service, who spoke on the desirability for biologists to lead a well-balanced community life.

NU

—Washington and Jefferson College, Washington, Pennsylvania

President—William S. Morrison, RD No. 6, Washington, Pa.

Vice-Pres.—Clyde L. Holmburg, 115 East Maiden St., Washington, Pa.

Sec.-Treas.—Chauncy Headly, 12 McClane Ave., Washington, Pa.

Corr. Sec.—Forrest G. Tompkins, 333 East Beau St., Washington, Pa.

Coun. Rep.—Dr. C. D. Dieter, Biology Dept., Wash. & Jeff. College.

PI

—Emory University
Georgia

Pres.—Harold Steel, Dept. Biology, Emory University, Georgia.

Vice-Pres.—William J. Rawls, P. O. Box 455, Emory University, Georgia.

Corr. Sec.—Miriam Runyon, 144 Garland Ave., Decatur, Georgia.

Rec. Sec.—Walter A. Rees, Box 46, Emory University, Georgia.

Treas.—Fred P. Amsler, 335 Winnona Drive, Decatur, Georgia.

Editor—Mrs. Helene Lammers, 125 Wilton Drive, Decatur, Georgia.

Dr. W. B. Baker, Dept. Biology, Emory University, Georgia.

RHO

—University of Illinois
Urbana, Illinois

President—Andrew A. Pandazi, 404 Nat. Hist. Bldg., Univ. of Ill., Urbana, Illinois.

Vice-Pres.—William C. Marquardt, Jr., 345 Nat. Hist. Bldg., Univ. of Ill., Urbana, Illinois.

Corr. Sec. & Rec. Sec.—Mrs. Twyla Eagan, 402 E. John St., Champaign, Illinois.

Treasurer—Carlton E. Melton, 404 Nat. Hist. Bldg., Univ. of Ill., Urbana, Illinois.

Editor—Marcelo H. Bert, 555 Nat. Hist. Bldg., Univ. of Ill., Urbana, Illinois.

Council Rep.—Prof. Norman O. Levine, 219 Veterinary Research Center, Univ. of Ill.

SIGMA

—University of Florida
Gainesville, Florida

President—Frederick Thompson; Pharmacology Dept., Univ. of Florida.

Vice-Pres.—Edmund Steuben; Biology Dept., Univ. of Florida.

Rec. Sec.—Carolyn Bicknell; Bacteriology Dept., Univ. of Florida.

Corr. Sec.—Marjorie Briggs; Biology Dept., Univ. of Florida.

Treasurer—Bert Theuer; Biology Dept., Univ. of Florida.

Editor—Nicholas Nader; Biology Dept., Univ. of Florida.

Council Rep.—Dr. Pierce Brodtkorb; Biology Dept., Univ. of Florida.

On March 6, 1952, the above officers were installed to lead Sigma Chapter of Phi Sigma for the academic year 1952-1953. Meetings are being held once a month in the newly rebuilt Science Hall on the University of Florida campus. The past two meetings were highlighted with talks on systems of education, one of which was presented by Mr. Shafik Balbaa on "Higher Education in Egypt" and the other by Mr. Enno Shierbeek, who spoke on "Education in the Netherlands." The meetings ended with informal discussions and refreshments.

Fraternally yours,
Nicholas Nader, Editor

UPSILON

—Miami University
Oxford, Ohio

President—Walter Gillespie, 311 Symmes Hall, Oxford, Ohio.

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PHI

—University of New Hampshire
Durham, New Hampshire

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Editor—Beatrice Newell—see above.

Council Rep.—Prof. C. F. Jackson, Nesmith Hall, Durham, New Hampshire.

Phi chapter formally initiated twenty one new active members and two new faculty members on December 12, 1951.

Even though initiation has taken up most of our time for the past few months, our VP certainly has outdone himself in providing interesting and different programs. Among the more interesting ones were an address on "Radioactive Tracers in Biology," an address on "Antibiotic Research," and a panel discussion on "Evolution" given by the members of the Zoology Seminar.

Future programs promise to be as varied and just as interesting. In February we plan to present a program consisting of an illustrated account of a trip to Panama by Dr. Milne. He will present colored movies of the different types of life that he and his wife studied on their trip there last summer.

Plans are being made to take a few more trips such as those to Passaconway which have always been so popu-

lar. Another beach party will probably be one of the highlights of this year as it was last year.

With these plans and many more in the process of being made, Phi Chapter promises to have a busy year and to provide new horizons for many of our new initiates.

Sincerely,
Beatrice Newell,
Corresponding Secretary

CHI

—Montana State College
Bozeman, Montana

President—Jack W. Lentfer, House Trailer 2, M. S. C., Bozeman, Montana

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Editor—Vernon E. Duiker, 608 So. Tenth, Bozeman, Montana.

Council Rep.—John A. Callenbach, 1414 So. Grand, Bozeman, Montana.

Chi Chapter is actively functioning and recently initiated fifteen new members. After the formal initiation, a banquet was held at which some excellent pseudo-scientific papers were presented by the new members. These were short humorous dissertations on topics presented by the membership committee. After the banquet, Willis B. Johnson of the Chemistry Research Department described the atomic energy plant at Oak Ridge, Tennessee, the relation of atomic energy to biology, and the new laboratory for working with radioactive substances which will soon be functioning here on our campus. Mr. Johnson has recently returned from a school he attended at Oak Ridge. Members initiated at this time were Jim Allison, Dr. Charles Bradley, Dr. R. B. Farnsworth, Harry Fenwick, Gere Lou Graves, Joan Huxley, Janice Kampschror, Carol Merz, Bob Miller, Dr. Lura Mae Odland, Bud Pile, Sharron Russell, John Spindler, and Oscar Swenson.

Noon meetings are held every two weeks and have been excellently attended. We have been fortunate in having good speakers and programs at these meetings. Attendance has been helped by the hot lunches prepared by our food committee.

Plans are progressing for observance of High School Week in May. At this time, high schools throughout the state send representatives to Montana State College. Phi Sigma sets up displays in the science building and shows visitors through the various biological departments.

This year marks the 25th anniversary of Chi Chapter. An observance of this occasion is planned in the near future, possibly in conjunction with the spring initiation.

Jack W. Lentfer, President

PSI

—University of Washington
Seattle, Washington

President—Margaret E. Dunn, School of Fish., Univ. of Washington, Seattle, Wash.

Vice-Pres.—Craig MacPhee, Dept. Zool., Univ. of Washington, Seattle, Wash.

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Editor—(to be appointed)

Council Rep.—Dr. M. H. Hatch, Dept. Zoology, Univ. of Washington.

This is a very tardy reply to your letter of November 30, 1951. I have been soliciting for contributions to "The Biologist" since the first of January. About six promises of future contributions have been made but I have nothing to send you at the present time. Dr. Edmondson has offered a limnological survey of two lakes in Washington and Dr. DeLacy has offered a description of the new Fisheries school on this campus. These articles should be forthcoming sometime in March. As soon as I can obtain more definite information from the other promisers I will relay it to you.

Fall Quarter

October 18, 1951, 8:00 P.M. Fisheries School Auditorium.

Dr. Johan T. Ruud, Walker-Ames Lecturer in the School of Fisheries, head of the Department of Marine Biology at the University of Oslo and the Director of the Institute of Whale Research. Dr. Ruud will speak on "Problems of Pollution in the Oslo Fjord."

November 29, 1951, 8:00 P.M., Fisheries School Auditorium.

Mr. Bernard Flageolle, Clinical photographer at Swedish Hospital for the past seven years and well known for his achievements in designing and building his own photographic equipment, will give an illustrated talk concerning his work.

Winter Quarter

Dr. Richard Van Cleve, Professor and Director of the School of Fisheries, will present an illustrated talk concerning his recent three months trip to Japan.

Dr. Philip Haddock, Assistant Professor of Forestry, will give a talk on the effects of the Kautz Creek Flood which occurred in 1947. Feb. 27 initiation ceremonies, also invitations now sent out to 66 students, 3 faculty, 4 honorary members.

Spring Quarter

Dr. Paul Ralph, Assistant Professor of Anatomy, will present an illustrated talk about his work with the phase microscope.

Dr. D. S. Davidson, Professor of Anthropology, will discuss the economy of the Australian aborigines.

Margaret E. Dunn
Fisheries center

OMEGA

—University of Oklahoma
Norman, Oklahoma

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Editor—Jack Bresler, Dept, Zoology, Univ. Oklahoma, Norman, Okla.

Council Rep.—Dr. A. I. Ortenburger, Dept. of Zoology.

Elizabeth Wingo, Lockney, Texas, has received the Phi Sigma scholarship award in recognition of exceptional academic attainment in a field of biology, it was announced Tuesday.

Miss Wingo, daughter of Mr. and Mrs. William H. Wingo, Lockney, and a student in the graduate school at the University of Oklahoma, received the award for work in bacteriology.

She is the first recipient of the scholarship award, which was made possible through the co-operative efforts of the OU chapter and the national council of Phi Sigma society.

Phi Sigma also presented two annual awards in recognition of unusual scholastic attainment. James B. Snow, 3019 N. Lee, Oklahoma City, a graduating senior in zoology and Paul Bryant, Norman, a graduate student in botany, received the awards.

ALPHA BETA

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Alliance, Ohio

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Sponsors—Dr. Gail Norris and Prof. O. H. Engle.

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Treasurer—Marian Westrick,

Editor—Richard Hartman, Dept. of Biology, Univ. of Pittsburgh, Pa.

Council Rep.—

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Since my last correspondence, Dr. Hans Ris of the Zoology Department, University of Wisconsin, has delivered the annual Phi Sigma Lecture. He chose as his topic "The Chromosomes—Their Structure, Chemistry and Function." We plan to write an article concerning his talk for publication in "The Biologist." However, since he discussed various phases of his present research endeavors, we must secure his permission before the article can be written. Therefore, the appearance of a summary of this lecture is, as yet, pending Dr. Ris' approval. I shall keep you informed as to the status of this possible contribution to "The Biologist."

This Sunday, April 6, the annual banquet meeting will be held in the Medford Hotel, Milwaukee. Father Gerard Smith, S. J., head of the Marquette University Philosophy Department, will address the group.

Here is a list of the ten new members initiated into Phi Sigma Society at our banquet: Howard Brossman, Martin Cipar, Frank Di Pierro, Glenn Esenther, Herbert Ewan, Walter Gomerac, Joseph Kapler, Seth Obeng, James Page, Walter, Queredo.

Father Smith's lecture, which was switched to "Science and Philosophy," was very fine. I believe he will be willing to submit it for publication in "*The Biologist*."

Arthur H. Kreitzer, Editor

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3806 No. 24th St., Tacoma, Wash.

December 13 was the initiation and installation of three new members into the Alpha Phi Chapter of Phi Sigma at the College of Puget Sound. They were Lawrence Tyler, Marysville, Washington; Fred Holmes and Duval Wiseman of Tacoma. After the ceremonies and banquet, Dr. Charles J. Gould, Assoc. Plant Pathologist of the Western Washington Experiment Station, Puyallup, Washington, spoke to us and showed slides of his recent study in Holland.

A graduate of Iowa State College, Dr. Gould received a six month Fulbright Scholarship Grant to Holland to work and study with diseases of ornamental plants, particularly bulbs—daffodil, hyacinth. At the Lab for Flower Bulb Research, Lisse, Holland, he worked on antibiotics, trying to isolate organisms to use as sprays.

In using the serological method, the Lab at Lisse is taking the lead in the world. Using either hot water or electricity, they are heating the soil to start the hyacinth bulbs maturing earlier. The 16,000 acres of bulbs produced are more than three times as much as are produced on the West Coast.

The Flower Bulb Research Lab, under the direction of the Professor Dr. E. Van Slogteren, has been developing a means of artificially retarding hyacinth and daffodil bulbs for shipment to the Southern Hemisphere where the season is the exact opposite. They give the bulbs a warm treatment, lower the temperature to 31°F., and give another warm treatment; then ship the bulbs to the Southern Hemisphere.

We here on the West Coast can still produce bulbs in spite of the tremendous competition from Holland, because our bulbs are still superior. The bulbs start developing two weeks earlier and are set in the field earlier, yielding a better quality.

Dr. Gould closed his talk with slides of the "Bulb Festival" that is comparable to Puget Sound's Daffodil Festival.

Our past Advisor, Professor James R. Slater, a zealous collector of amphibians and reptiles, has retired from the College of Puget Sound after 32 years in the Biology Department. He is now living at Lakelands, Florida. He was the adviser for the Charter Phi Sigma group.

Corrinne Engle, Editor

Alpha Phi Chapter, Phi Sigma

ALPHA CHI

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Univ. of Phil.

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ALPHA OMEGA

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Athens, Georgia

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of Biology



UNITED STATES DEPARTMENT OF JUSTICE

FEDERAL BUREAU OF
INVESTIGATION
WASHINGTON 25, D. C.

The Federal Bureau of Investigation is now accepting applications for the positions of Special Agent and Special Agent (Accountant) from qualified candidates who possess an LLB degree or accounting degree for resident schools. For a temporary indefinite period applications are also being accepted for the position of Special Agent Employee from men who possess a four year degree (such as AB, BS, or other) from accredited resident colleges.

Applicants must:

- 1) Be male citizens of the United States.
- 2) Be at least five feet seven inches in height without shoes.
- 3) Have reached their twenty-fifth but not their forty-first birthday.
- 4) Possess vision of not less than 20/40 and 20/50 (Snellen) corrected to 20/20.
- 5) Possess normal hearing and color vision and be able to pass a rigid physical examination. They must be capable of performing strenuous physical exertion and have no

physical defects which would interfere with their use of firearms or participation in raids, dangerous assignments or defensive tactics.

- 6) Be willing to serve in any part of the United States or territorial possession.
- 7) Be qualified in the operation of passenger vehicles.

Duties:

The above positions entail the investigation of: (1) violation of those laws of the United States over which the Federal Bureau of Investigation has jurisdiction, (2) Subversive activities endangering the internal security of the United States.

Entrance Salary:—\$5500 per annum.

Retirement:

An agent may retire after 20 years service, at the minimum age of 50. His pension is based upon the average of his highest five years salary. He receives 2 % of this amount for each year of service up to a maximum of 60%.

How To Apply:

Applicants will be afforded an interview and must pass a written examination. Appointments are subject to a complete character and fitness investigation. Application forms and further information may be secured from the nearest field office of the Federal Bureau of Investigation.



Need for Free Inquiry

The business of a college or university is not propaganda but truth. Its means of disseminating truth is not by indoctrination but by free inquiry into facts, candidly presented in as objective a manner as the sources of information will permit. In a proper university curriculum, there are no taboos except the taboos of bad taste and bad manners. Students in a free world need to know about socialism and communism and the pseudo democracy of the totalitarian states. By the same token

they need to know about individualism, free enterprise, free religion, and all the personal freedoms that are indispensable to our forms of economic and political organization. Free inquiry is not propaganda; teaching *about* is not indoctrination. The facts will speak for themselves and, in my opinion, if the facts are candidly presented our world will not suffer by comparison.—President Howard L. Bevis, The Ohio State University, in *The Journal of Higher Education*.



ANNUAL MEETING OF THE A.C.H.S. COUNCIL

February 23 and 24, 1952

Dr. David D. Henry, President of Wayne University, Detroit, Michigan and a member-at-large of the Council of Association of College Honor Societies was the guest speaker at the dinner of the Council held in Hotel LaSalle, February 23, 1952.

"The role of higher education," said he, "has never been more important than today. It is of crucial short-range importance in National Defense. It is difficult to understand why this assessment has not been made. No one can disagree with the statement, often made, that effective resistance to the Communist allies on the part of the nations of the free world, particularly on our part, can never be based upon an equal number of men in arms. Our superiority must rest with mechanization, armed power and the creative use of our resources that can come only from science and trained leadership.

"If then, we accept the premise that our very national security is dependent upon the ideas and developments that come out of our research laboratories and the trained leadership that comes from those who have the ability to lead, it follows that in the interest of national safety we must find those people who have the aptitude and the ability so to be used and must place them in programs of training which will equip them to make their maximum contributions.

"A major task confronting all of us in the months ahead is to resist the efforts of those who would regard the need of education and of youth for education as 'postponable'; those who would destroy the source of our strength for the long struggle ahead of us by considering it expendable in the demands of today.

"Higher education is also vital in our long-range welfare. In these uncertain times, when the life course of the individual is influenced, and almost

determined, by events and forces beyond his control, it is essential that he be inspired by faith that what he is called upon to do now is worth doing, both for himself and for the improvement of the lot of men. Basic to that faith is educational opportunity: the 'ladder of social mobility in our society.' The faith of America in values of higher education has been justified. Let's not forget its premises or let the public forget.

"First, the American people believe in the social benefits of individual achievement. Society will be the better by virtue of the superior vocational and professional competence of the individual. The 'G.I. Bill of Rights' to our veterans was not alone a gesture of appreciation from a grateful nation. It stemmed also from the conviction that we could not afford to lose, through lack of training, the talents of the thousands who wore the uniform in war time. Society as a whole profits from the competence of the doctor, the engineer, the lawyer, the nurse, the homemaker, the scientist—and so society underwrites the means that will bring the individual to a high level of competence in his chosen work.

"We have tremendous faith in the discovery of new ideas. The history of America has been the breaking of frontiers. With the land frontiers gone, we now know that the frontiers of knowledge are even greater resources for the future. Because the campus is dedicated to the discovery of new ideas and new truths, this resource is offered to the youth of today.

"But to offer this resource to youth poses another problem. A recent report of the President's Commission on Higher Education in America clearly demonstrates that in terms of the abilities of young people to do advanced work, if programs are geared to their interests and if there are facilities in

which to conduct the work, by 1960 the enrollment of our institutions could be doubled—and the present enrollment is twice as high as in any pre-war period.

"At a time when our place as a nation in world affairs is dependent more than ever before upon trained leadership, upon the development of scientific achievement, upon the conquest of the frontiers of knowledge—in short, at a time when trained brain-power is acknowledged to be the key to the future of our nation, we allow a situation to continue where able and talented youth are deprived of educational opportunity because they were born into families of limited economic means.

"We find money for new hospitals and new hospital beds; but do little to increase the supply of doctors and nurses and technicians who service those beds. We increase our taxes for new highways for motor cars, but find it difficult to find money for the 'highways for new ideas into a better future.' Each year we continue to do less than we might do in erecting a capital structure for tomorrow's dividends in human values.

"The task confronting all who are identified with education is to accept as a professional and personal mission the vigorous interpretation to the public of the necessity of extending educational opportunity and adequately supplying the means for getting the job done," concluded Dr. Henry.

The 1952 annual meeting of the Council of the Association of College Honor Societies, held in the Illini Center at the LaSalle Hotel in Chicago February 23 and 24, 1952, accomplished many worthwhile projects. Twenty-one of the twenty-three member societies of A.C.H.S. were represented. The meetings were presided over by Dr. George L. Webster, President (Rho Chi, Pharmacy, University of Illinois, College of Pharmacy, Chicago), with Vice-President Asst. Dean Stanley H. Pierce (Phi Kappa Phi, all academic, College of Engineering, University of Illinois, Urbana) as program chairman and Mr. Robert H. Nagel (Tau Beta Pi, engineering, University of Tennessee) as secretary.

A petition was received from Alpha Kappa Mu, general-scholarship honor society in negro institutions. It was voted to admit this society provided it submits evidence of proper constitutional changes concerning the limitation of eligibility to the upper 20% of the class and the eligibility to periods not earlier than the end of the fifth semester or seventh quarter of the regular college program and provided that Alpha Kappa Mu submits evidence that it has eliminated from its rolls those chapters in non-accredited institutions.

A petition for associate membership was received from Alpha Pi Mu, departmental honor society in industrial engineering. This society was accepted for associate membership. (Associate membership, non-voting, according to the Constitution of A.C.H.S. differs from active membership by the fact the society does not have ten or more active collegiate chapters located in two or more regions in the Country and/or has not existed as a national organization for at least ten years.)

The Committee on Eligibility and Admissions reported further progress toward expanded membership in the Association. A number of societies are being assisted in meeting A.C.H.S. standards. To further this aim, the president extended to certain honor societies an invitation to attend the meetings as observers. The following accepted and were present Saturday afternoon and evening and Sunday morning:

- Dr. Stephen J. Wright (Alpha Kappa Mu, all academic in Negro institutions), Hampton Institute
- Dr. George W. Gofe, Jr. (Alpha Kappa Mu), Florida A. & M. College
- Miss Pearl Gore (Alpha Kappa Mu), Chicago, Ill.
- Dr. Bruce Lineburg (Beta Beta Beta, biology), Lake Forest College
- Dr. Elizabeth Koch (Iota Sigma Pi, chemistry—women), Chicago
- Miss Lenore Sprowls (Iota Sigma Pi), Chicago, Ill.
- Dr. J. M. Sachs (Kappa Mu Epsilon, mathematics), Chicago Teachers College

Prof. W. Leon Godshall (Pi Gamma Mu, social sciences), Lehigh University

Prof. C. W. Shroeder (Pi Gamma Mu), Bradley University

Prof. Benjamin A. Wasil (Chi Epsilon, civil engineering), Illinois Inst. of Tech.

Round-Table Discussions were held on the following subjects:

a. Legal problems that are and perhaps will be faced by honor societies—national organization and chapters.

b. Regional conferences of honor societies—such as the conference held in Detroit for several years.

c. Difficulties, in present days, of obtaining grades and particularly class rank in many institutions. It developed that this operation is comparatively simple in institutions using mechan-

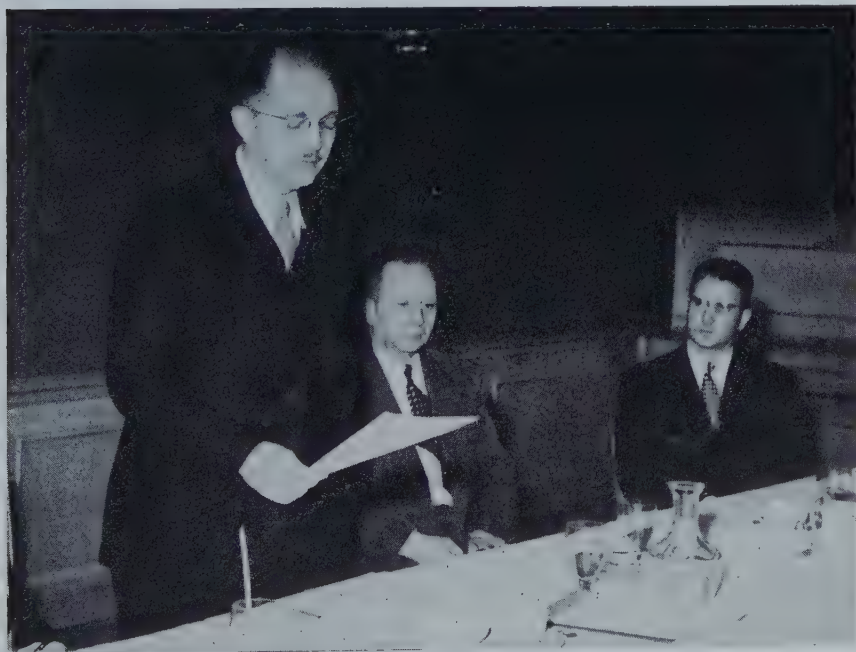
ical or electronic computing machines but that in others the "labor" of determining the class rank almost invariably falls to each society (or to a combination of these in many cases). The executive committee was requested to confer with American Association of Collegiate Registrars.

The following officers were elected to hold office until the annual meeting of 1953:

PRESIDENT: Dr. Maurice L. Moore, Alpha Epsilon Delta, 7 Brookside Circle, Bronxville 8, N. Y.

VICE-PRESIDENT: Paul H. Coy, Tau Sigma Delta, 2820 Pittsfield Blvd., Ann Arbor, Mich.

SECRETARY-TREASURER: Robert H. Nagel, Tau Beta Pi, University of Tennessee, Knoxville, Tenn.



Dr. David L. Henry, President of Wayne University, Detroit, Mich., was the Guest Speaker

(To Dr. Henry's left: Council President George L. Webster, Council Vice-President Stanley H. Pierce)

In addition to these three, the following form the executive committee:

Ex-officio: Dr. George L. Webster, Rho Chi, College of Pharmacy, University of Illinois, Chicago.

At-Large: Dr. Harvey L. Johnson, Phi Sigma Iota, Dept. of Romance Languages, Northwestern University, Evanston, Ill.

Mrs. M. Stanley Ginn, Mortar Board, 43 West Blvd., S. Columbia, Mo.

The following were elected members-at-large of the Council:

Dr. A. J. Brumbaugh, President of Shimer College, Mount Carroll, Ind.

Dr. David D. Henry, President of Wayne University, Detroit, Mich.

Dr. A. B. Kirwan, Dean of Men, University of Kentucky, Lexington.

At a meeting of the Executive Committee held Sunday afternoon, the following committee chairmen were appointed:

PROGRAM: Prof. P. H. Coy

STANDARDS AND DEFINITIONS:

Dr. R. W. Bishop

ELIGIBILITY AND ADMISSIONS:

Dr. W. M. White

PUBLICITY AND PUBLICATIONS:

A. B. Zerby

CONSTITUTION AND BY-LAWS:

Dr. G. L. Webster

LEGAL PROBLEMS: Mrs. M. S.

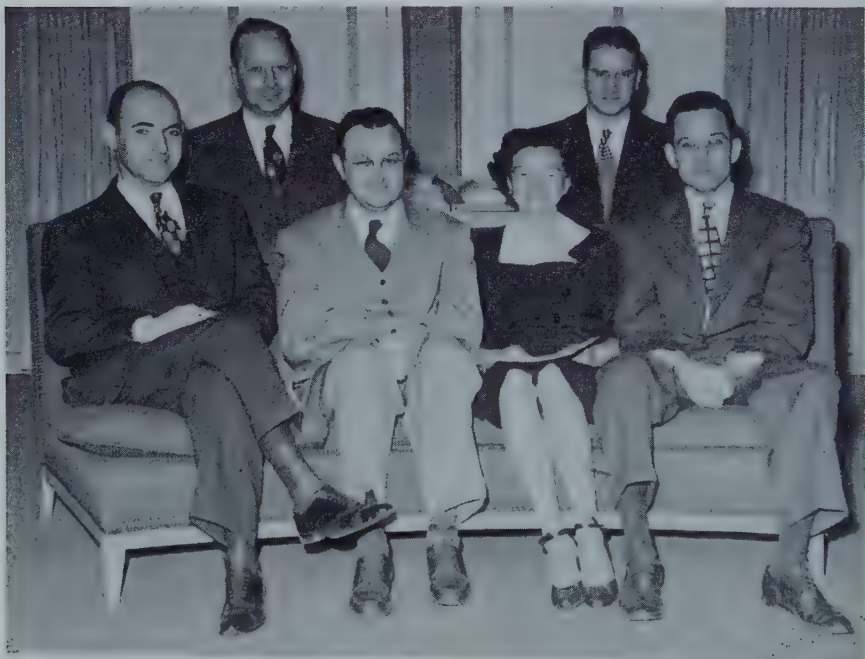
Ginn

HONOR SOCIETY COUNCILS AND

HONOR DAYS: Dr. P. E. Lull

REGIONAL CONFERENCES: Dean

W. E. Alderman



Officers and Executive Committee of A.C.H.S. Left to right: Paul H. Coy, Tau Sigma Delta, Vice-President; Maurice L. Moore, Alpha Epsilon Delta, President; Mrs. M. Stanley Ginn, Mortar Board; Robert H. Nagal, Tau Beta Pi, Secretary-Treasurer; George L. Webster, Past President; Stanley H. Pierce, Past Vice-President. (Harvey L. Johnson, Phi Sigma Iota, left before photo was taken.)

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PHI SIGMA BIOLOGICAL HONOR SOCIETY

"The object of Phi Sigma is to promote interest in biological research. Although always designated as an honorary biological research society, it should be considered as a working guild of biologists interested in research. In effect, election to Phi Sigma should be an opportunity for better work, rather than merely election to an honorary society."

Mile Posts

- 1915 March 17, Alpha Chapter organized, Ohio State University, Columbus.
- 1916 May, Central Governing Body organized, BIOLOGIST first issued.
- 1917 June, last War-time BIOLOGIST issued.
- 1921 February, BIOLOGIST revived.
- 1924 December, First National Meeting, Constitution revised, Washington, D. C.
- 1925 December, Second National Meeting, First Science Program, Kansas City.
- 1926 December, Third National Meeting, Second Science Program, Philadelphia.
- 1927 December, Third Science Program, Nashville.
- 1928 December, Fourth National Meeting, Coat-of-Arms adopted, Fourth Science Program, New York.
- 1930 January, Council Meeting, Ritual Revised, Norman, Okla.
December, Fifth National Meeting, Fifth Science Program, Cleveland.
- 1931 Phi Sigma Letters Registered, U. S. Patent Office.
- 1932 December, Sixth Science Program, Atlantic City.
- 1933 June, Sixth National Meeting, Seventh Science Program, Chicago.
- 1935 December, Seventh National Meeting, Eighth Science Program, St. Louis.
- 1937 December, Eighth National Meeting, Ninth Science Program, Indianapolis.
- 1939 December, Ninth National Meeting, Tenth Science Program, Silver Anniversary, Ohio State University, Columbus.
- 1941 December, Tenth National Meeting, Dallas, Texas.
- 1946 December, Eleventh National Meeting, Boston, Mass.
- 1948 December, Twelfth Meeting, Eleventh Science Program, Albuquerque, N. Mex.
- 1949 February, Joins the Association of College Honor Societies.
- 1950 December, Thirteenth Meeting, Denver and Boulder, Colorado.